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Mine Production

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Mining in British Columbia

Volume I

Mine Production

By Mathew S. Hedley

**Province of
British Columbia**
Ministry of
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MINING IN BRITISH COLUMBIA (1975–1980)

FOREWORD

A continuing and relatively complete summary of mining activity was published as the Annual Report of the Minister of Mines, starting in 1874. A change in the form of presentation occurred, with a separation into two publications, in 1969. Much material was not made available in any form after 1974, and the record was consequently broken after 100 years. It is the intent of the present two-volume publication to repair this discontinuity, in order that the published record of activities at producing mines of all sorts is complete to the end of 1980.

The hiatus in the publishing of data was the result of changes in departmental functions and lack of appropriate personnel. The expanded Department, now the Ministry, is still in process of adopting a uniform series of annual publications once covered by a single volume.

In order that the reader who is intent on filling in the gaps in the record, once provided by a single annual report, may understand the development of events, a brief statement of the evolution of publications follows. The changes were in part brought about by the fact that the single volume had become too large and unwieldy.

An Annual Report of the Minister of Mines was published from 1874 to 1959, after which it was the Annual Report of the Minister of Mines and Petroleum Resources until 1979, when it became the Annual Report of the Ministry of Energy, Mines and Petroleum Resources.

The Annual Report of the Minister contained virtually all data and reportage of the mining industry from 1874 to 1968. In that span of time all statistics relating to metals, industrial minerals, placer gold, and coal; all descriptions of mines and mining activity; and a full report of the Chief Inspector of Mines were together in one annual volume.

In 1969, descriptive material was published separately in a single volume, referred to as Geology, Exploration and Mining in British Columbia (GEM). Descriptions of mines and production activity were eliminated in 1975, and Geology, Exploration and Mining was broken down into separate publications.

The annual report of the Chief Inspector of Mines was published in full until 1974. In succeeding years the report was drastically reduced in scope, with deletion of descriptions of fatal accidents and dangerous occurrences, certifications, etc.

The two-volume report, Mining in British Columbia (1975–80), is written to ensure that an unbroken published record of Ministry activity exists from 1874 to the end of 1980, in Annual Report of the Minister, in Geology, Exploration and Mining (GEM), and in the present report.

Volume I—Mine Production presents the location, a summary of activity, a brief description, and production statistics for essentially all active mines or properties in British Columbia that produced metals, non-metals, or coal in the period 1975–80.

Volume II—Report of the Chief Inspector presents the full activities of mines inspection, accidents, and safety practices in all types of mining. It provides an account of the work of the Inspection and Engineering Branch relating to all phases of mineral production, exclusive of conservation and reclamation.

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INTRODUCTION

The form of presentation of data relating to producing metal mines and properties has changed somewhat from past years. Prior to 1969, properties were listed according to Mineral Survey Districts and Mining Divisions. Starting in 1969, listing was by reference to latitude and longitude and by position according to the National Topographic System (NTS). This change was made because the Mineral Survey Districts no longer existed and their historical usefulness had vanished, and because map position is the only positive means of locating a mineral showing or property.

Because the present volume is the only six-year summary and because individual properties are listed in a slightly different manner, the following notes are intended to clear up uncertainties that may exist concerning the present format.

Individual mines and properties are listed alphabetically by Mining Divisions, which also are in alphabetical order. This is in accord with listing in the annual statistical tables.

Property locations are given precisely by latitude and longitude and the general geographic position by reference to an NTS map sheet, east or west half, at a scale of 1:50 000. Figure M-1, in pocket, graphically shows the locations of those properties which had an annual production of 1 000 tonnes or more, and the years in which such production was attained. Figure M-2, in pocket, shows the locations of all properties which are described in the text. The properties are numbered sequentially as they appear in the text.

References are to publications of the Ministry and of the Department of Mines, and to outstanding articles in publications readily available in libraries. The notation MI refers to the Mineral Inventory, a continuing record (Minfile) of data relating to mineral properties in the Province. It is the basic data file kept by the Ministry and was established in its present form, available to the public, in 1977.

Production figures were first compiled in metric units in 1975.

Metal production statistics are listed by year in Table M-1 at the end of the volume. The figures are the same as those published in Table 3-12 in the statistical section of each Annual Report of the Minister for the years 1975–80, and are included here for ready reference. The appropriate figures are also given under the description of each producing mine or property; this is done for added convenience to the reader.

In each year, 1975–80, production figures are shown in Table M-1 for several properties which are not otherwise mentioned. This means that such properties were not visited in that particular year by field officers of the Ministry, but that they made ore shipments, returns from which were available. In the six years, 50 such properties existed in the Slocan (*See* note under Slocan Shipping Mines, pp. 32 and 33) and about 40 elsewhere in the Province at large. These simply are ore sources, appearing one or more times in Table M-1, pages 53 to 75. They are not numbered.

METAL MINES

LYNX, MYRA, HW, PRICE (Fig. M-2, NTS 92, No. 1)

Alberni, M.D. Lat. 49°34′ Long. 125°35′ (92F/12E)

The Lynx mine is on the north side of Myra Creek and the Myra mine is on the south side, 1.5 kilometres west of the south end of Buttle Lake. The HW mine is near the Myra, and the Price mine is on the west side of Thelwood Creek, 1 kilometre southwest of the south end of Buttle Lake. Myra Creek is 88 kilometres by road from Campbell River.

The combined property is an extensive one, with many Crown-granted and recorded mineral claims. It was owned by Western Mines Limited until April 1981, when the name was changed to Westmin Resources Limited, 1103 Three Bentall Centre, 595 Burrard Street, Vancouver V7X 1C4.

The four mines are separate operations, but all ore was treated at a single concentrator adjacent to the Lynx mine. The Lynx mine started production in 1967, the Myra mine in 1972, and the Price and HW were under development in 1980. The concentrator had a capacity of about 1 000 tonnes per day; a separate circuit treated higher grade ore from the Myra mine. Tailings not used as backfill in cut-and-fill stopes were discharged deep into Buttle Lake. Mine water was discharged into settling ponds. Copper, and lead, and zinc concentrates were trucked to a ship-loading facility at Campbell River and shipped to various buyers.

The ore deposits consist of massive sulphides, including pyrite, chalcopyrite, sphalerite, and galena, occurring in volcanic rocks of the Sicker Group, rocks believed to have formed in a submarine environment. The massive sulphides are closely associated with rhyolitic volcanic rocks.

The Lynx, Myra, and Price mines are within a single structural-stratigraphic zone 400 to 500 metres thick, which has been traced over a strike length of 6 000 metres. The HW mine, under development in 1981, is at a stratigraphic level 100 metres lower.

In the mine area, rocks ranging from massive volcanic rock to breccias, tuffs, and clastic sediments have been affected by dynamothermal metamorphism. The Lynx, Myra, and Price mines are segments of a zone of rhyolite, other volcanic rocks, and ore. Large amounts of sericitic, siliceous, and pyritic rock occur beneath the orebodies. Schistosity (which may be folded) is localized primarily in sericitic altered rocks associated with the ore zones. The history of the zone is complex, as it contains rocks ranging from flows and breccias to fine-grained tuffs, all of which have undergone a probably long period of deformation and alteration.

Production from the Lynx mine was first from an open pit, but was entirely from underground by the end of 1975. The mine was developed from a shaft, extending from the No. 10 to the No. 16 level, and most ore was mined by cut-and-fill stoping. Mill tailings were used as backfill.

The Myra mine was developed by a decline driven from the portal at No. 11 level to No. 13 level. The workings were trackless and stoping was almost entirely by cut-and-fill, using mill tailings as backfill. Ore was stockpiled as normal or higher grade, and was trucked to the concentrator. Ventilation was by air drawn through an adit in the Price mine.

Complete statistics are not available, so it is not possible to give the tonnage from each mine for each year, but those tonnages were comparable in 1975 and 1977. In 1979, tonnage from the Lynx was more than twice that from the Myra.

The Price mine is a long-known mineral deposit that was developed as understanding of the geology was gained from the Lynx and Myra operations. It was partly developed in 1976 and 1977, was idle in 1978, and development resumed in 1979. The road from the Price No. 13 level was extended to the No. 9 level portal, which adit level was driven 448 metres; also, the road was extended to the portal of the Price No. 5 level. In 1980 the No. 5 level was driven 485 metres and No. 4 adit was driven 215 metres before work stopped for the winter.

The HW mine, 100 metres stratigraphically below the Myra ore zone, was discovered by a surface drill hole at a depth of 430 metres below Myra Creek valley. A shaft was collared and sunk 12 metres by the end of 1980. According to company sources, substantial reserves were indicated.

The camp, situated near the Lynx mine, was closed at the end of 1979 except for key operating and mill personnel. A number of the work force had for some years commuted from Campbell River, and, after the company purchased three buses in 1979, all hourly rated employees commuted from Campbell River and Courtenay each day.

References: *Minister of Mines, B.C.*, Ann. Rept., 1964, pp. 157–166; *CIM*, Bull., Dec. 1980, pp. 71–90; MI 92F-71, 72, 73.

Lynx and Myra Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	260 717	Copper concentrates, 7 882 t; lead concentrates 6 767 t; zinc concentrates, 30 597 t	642 837	35 977 151	2 707 398	3 459 337	18 090 898	70 372
1976	269 293	Copper concentrates, 8 830 t; lead concentrates, 7 093 t; zinc concentrates, 31 653 t	695 494	40 435 642	2 953 251	3 586 262	18 987 531	72 800
1977	269 068	Copper concentrates, 8 670 t; lead concentrates, 6 466 t; zinc concentrates, 31 247 t	632 075	34 909 727	2 856 881	3 356 196	18 607 822	72 139
1978	269 033	Copper concentrates, 11 465 t; lead concentrates, 6 463 t; zinc concentrates, 32 400 t	628 094	36 150 053	3 294 888	2 768 914	18 003 921	71 704
1979	266 877	Copper concentrates, 12 284 t; lead concentrates, 7 178 t; zinc concentrates, 34 089 t	802 888	37 990 999	3 565 016	3 137 575	18 933 570	79 887
1980	278 244	Copper concentrates, 6 987 t; lead concentrates 3 738 t; zinc concentrates, 32 642 t	444 126	20 453 988	1 880 636	1 568 857	17 918 936	76 262

ATLIN RUFFNER (Fig. M-2, NTS 104, No. 2)

Atlin M.D. Lat. 59°43.9′ Long. 133°31.2′ (104N/12E)

This old property is on Mount Vaughan, approximately 16 kilometres east of the Atlin Highway by road along Fourth of July Creek.

It was under investigation in 1975–76 by Atlin Silver Corporation; mine office, Atlin.

Silver-lead-zinc mineralization occurs as fissure fillings along cross-faults or dykes in granite. In the summer of 1975 a trailer camp was established and some stoping was done on the No. 2 vein system. A 50-tonne mill was partially built, and 137 tonnes of ore was shipped. The mill was completed in 1976, when 1 610 tonnes of ore was treated and 64 tonnes of concentrates was shipped.

Reference: MI 104N-11.

Atlin Ruffner Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	137	Crude ore	807	313 518	—	18 386	—	—
1976	1 610	Lead concentrates, 64 t	678	429 843	376	34 455	4 017	—

BOSS MOUNTAIN (Fig. M-2, NTS 93, No. 3)

Cariboo M.D. Lat. 52°06′ Long. 120°54′ (93A/2W)

This property of 90 mineral claims and fractions is on the eastern slope of Takomkane Mountain, 91 kilometres by road east from 100 Mile House and approximately 9 kilometres from the mine townsite at Hendrix Lake. It is owned by Boss Mountain Division of Noranda Mines, Limited; mine office, Hendrix Lake V0K 1R0.

The ore deposit lies within the Takomkane granodiorite batholith, near the younger Boss Mountain quartz monzonite stock. Molybdenite occurs in quartz-filled breccia zones and in quartz veins and stringer zones in subparallel swarms surrounding breccia pipes. It is thought that the brecciation was related to intrusion of the quartz monzonite stock.

Production began in 1965 at a nominal rate of 1 000 tonnes per day, and in the late 1970's was at a rate of about 2 100 tonnes per day.

Early production was entirely from underground, with methods adapted to circumstances, but in general by longhole drilling from sublevels and the use of scrapers and mucking machines. The mine was developed from an 1 800-metre adit and an internal shaft 270 metres deep.

By 1975 there was some concern regarding the life of the mine, and test work was done on a possible open pit. In 1976 underground reserves improved, and in 1977 an open pit was started, connected by raise to the mine workings. In 1978 about one-third of the production of 541 928 tonnes came from underground, and in 1979 a second pit was started. In 1980 nearly half the production came from underground, and a third open pit was started. In 1980 also, a new haulage road was begun, a primary crusher was installed for pit ore, and an autogenous grinding mill added to the concentrator. Test work on reclamation was done during 1975 to 1980.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, GEM, 1974, p. 234; MI 93A-1, 13 to 16.

Boss Mountain Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	545 496	Molybdenite concentrates, 1 927 t; containing 1 094 002 kg of molybdenum	—	—	—	—	—	—
1976	564 036	Molybdenite concentrates, 1 843 t containing 1 022 897 kg of molybdenum	—	—	—	—	—	—
1977	523 453	Molybdenite concentrates, 2 035 t containing 992 588 kg of molybdenum	—	—	—	—	—	—
1978	541 928	Molybdenite concentrates, 1 384 t containing 784 516 kg of molybdenum	—	—	—	—	—	—
1979	496 108	Molybdenite concentrates, 1 094 t containing 614 961 kg of molybdenum	—	—	—	—	—	—
1980	533 254	Molybdenite concentrates, 1 523 t containing 789 806 kg of molybdenum	—	—	—	—	—	—

GIBRALTAR (Fig. M-2, NTS 93, No. 4)

Cariboo M.D. Lat. 52°31′ Long. 122°17′ (93B/9W)

Approximately 19 kilometres north of McLeese Lake, on the western slopes of Granite Mountain and on Granite Creek.

Gibraltar Mines Ltd., Box 130, McLeese Lake, is a subsidiary, 72 per cent owned, of Placer Development Limited. The property comprises (1980) 326 mineral claims and leases.

The ore zone is a porphyry copper-molybdenum deposit. It occurs in a leucocratic phase of a Triassic pluton of variable compostion. The mine phase, which contains the ore zone, is a quartz diorite that has been altered and deformed.

The ore occurs in an elliptical zone measuring about 3.2 kilometres by 1.6 kilometres, parallel with an original igneous foliation dipping steeply southward. Mineralization took place within a complex history of deformation, which involved folding of mineralized foliations.

Ore minerals are chalcopyrite and molybdenite. The Gibraltar East and Pollyanna pits have well-defined zones containing supergene chalcocite.

Four orebodies are known, of which three, Gibraltar East, Granite Lake, and Pollyanna, have been mined by open pit. The Gibraltar West orebody was diamond drilled in 1980 with a view to future production.

The concentrator was designed for 30 000 tonnes per day and has an actual capacity of more than 41 000 tonnes per day. It has been in operation since 1972.

The Gibraltar East pit was developed first and was mined from 1972 to September 1974, when the Granite Lake pit was brought into production and was mined until September 1977. In 1977 production was begun in the Pollyanna pit and continued until mid-1980. All of this activity was what was termed Phase I operation.

Phase II mining in the Gibraltar East orebody started in July 1980, and preparation for Phase II mining in the Granite Lake pit began in 1980. Also in 1980, exploratory diamond drilling was done on the Pollyanna and Gibraltar West zones. Phases I and II operations were based on economic considerations. Initial plans were made to mine, first, ore of higher grade, to reduce capital indebtedness at as rapid a rate as possible in the early life of the operation.

Reclamation practiced through 1975–80, involved aerial seeding and fertilization, and planting coniferous seedlings.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, GEM, 1973, pp. 299–318; MI 93B-6, 7, 12, 13.

Gibraltar Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	10 388 118	Copper concentrates, 155 736 t; molybdenite concentrates, 470 t; containing 251 672 kg of molybdenum	—	5 391 611	41 165 032	—	—	—
1976	7 762 298	Copper concentrates, 101 722 t..................	—	3 343 168	26 142 438	—	—	—
1977	12 764 959	Copper concentrates, 144 317 t; molybdenite concentrates, 258 t, containing 137 202 kg of molybdenum	—	3 310 292	40 255 709	—	—	—
1978	5 135 655	Copper concentrates, 74 705 t; molybdenite concentrates, 238 t containing 119 174 kg of molybdenum	—	3 265 628	19 713 622	—	—	—
1979	10 446 035	Copper concentrates, 115 388 t; molybdenite concentrates; 752 t; molybdic trioxide, 25 t containing 408 676 kg of molybdenum	—	3 373 452	32 217 953	—	—	—
1980	12 844 000	Copper concentrates, 119 325 t; molybdenite concentrates, 17 t; molybdic oxide, 987 t containing 528 461 kg of molybdenum	—	4 639 395	32 672 980	—	—	—

MOSQUITO CREEK (Fig. M-2, NTS 93, No. 5)

Cariboo M.D. Lat 53°07′ Long. 121°36′ (93H/4E)

This property of 25 Crown-granted mineral claims is on the eastern flank of Island Mountain near the headwaters of Mosquito Creek. It is at an elevation of about 1 400 metres, about 4 kilometres from Wells.

It is owned by Mosquito Creek Gold Mining Company Limited, Box 6808, Calgary, Alberta. The company was formed in 1971 by A. H. Jukes to explore long-known mineralization close to the former Island Mountain mine, particularly to explore what has been known in mine parlance as the Rainbow-Baker contact, a site for gold-quartz veins and pyritic replacements in limestone.

As a result of initial exploration a shaft was sunk 157 metres in 1974 and underground development was done in 1975. In 1979 more lateral work was done, and some 1 000 tonnes of ore was mined and stockpiled. A concentrator, started in 1979, was completed early in 1980 and 11 419 tonnes of ore was milled.

Reference: MI 93H-10.

Mosquito Creek Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1980	11 419	Gold bullion	136 869	36 865	—	—	—	—

SULLIVAN (Fig. M-2, NTS 82, No. 6)

Fort Steele M.D. Lat. 49°43′ Long. 116°01′ (82F/9E; 82G/12W)

The Sullivan mine and concentrator are within the city limits of Kimberley. The mine is on Mark Creek, 3.2 kilometres north of city centre and the concentrator is 3.2 kilometres south of city centre. The owner is Cominco Ltd., 200 Granville Street, Vancouver V6C 2R2.

Geology

The Sullivan orebody, one of the largest base metal deposits in the world, is a lens-like body approximately 9 000 metres in diameter and 100 metres thick in its central part. It is tilted to the east. It is conformable with the transition zone between the sedimentary rocks of the Lower and Middle Aldridge Formation, and is believed to have formed in a small submarine basin.

The western part of the deposit lies directly above its conduit zone, the brecciated and altered footwall of the deposit. Linear, north-trending breccia zones, disseminated and vein sulphides, and extensive alteration to a dark, dense chert-like tourmaline-rich rock are conspicuous features of the altered footwall. Albite-chlorite-pyrite alteration, restricted to the western part of the deposit, occurs in crosscutting zones in the footwall tourmalinite, within the orebody itself, and in the hangingwall, up to 100 metres above the orebody.

The principal sulphides are pyrrhotite, sphalerite, galena, and pyrite. Chalcopyrite and arsenopyrite are minor constituents. Boulangerite is locally prominent, magnetite is fairly common, and small amounts of cassiterite occur widely but are commonest in the western part. In general, metal distribution patterns are directly related to nearness to zones of chaotic breccia; higher absolute values, and higher lead-zinc and silver-lead ratios, overlie the breccia zones. The western part of the deposit is more massive than the eastern part, which includes five distinct, conformable layers of generally well-laminated sulphides separated by clastic (silty) rocks. The sulphide layers thin to the east, away from a transition zone between the western and eastern parts of the orebody, and at the limits of the deposit are composed of iron sulphide bands.

Operations

Mining in the past was in open stopes, leaving substantial pillars. The stopes were later filled with surface gravels, caved waste, float material from the sink-float plant, and in some cases tailings to form seals. The mining of pillars became an increasingly important part of operations, and now much of the ore remaining in the mine is in pillars.

In areas of the mine which are close to surface, generally favourable ground conditions are encountered, although some roof support may be required locally in blocky ground. In some of the deeper areas of the mine, incompetent hangingwall rocks have created significant problems of ground support.

Subsidence has occurred over mined-out areas. Caves have formed and have in some instances been filled with gravel. An extensive program of ground surveillance was carried out during the years 1975 to 1980, to monitor the extent and progress of the subsidence.

Production of spontaneously heated ore (hot ore) has been a continuing problem for many years, and although latterly it has been better under control, procedures to minimize the heating of the ore and to contain the resultant sulphur dioxide remain a problem.

In 1975 a start was made on conversion to trackless mining with diesel-powered equipment, and this work was still in progress in 1980. Primary access was provided to some areas, and the air quality and flow were extensively monitored. As part of an overall upgrading of the mine ventilation system, two new ventilation shafts were started in 1980.

Ore production was mainly by longhole blasting, with recovery by slusher sublevels or trackless drawpoints beneath the ore blocks. In 1979 one pillar was mined with a method of sublevel caving, and several pillars were so mined in 1980. A few small open stopes were operated as well.

During the four-year period 1977–80 there was driven a yearly average of 4 300 metres of raises, 3 800 metres of drifts, and 1 100 metres of underground ore-outline diamond drilling. In 1977, five holes were diamond drilled from surface as part of an exploration program; one of these holes was drilled to 1 372 metres. An underground exploratory hole was started with a projected ultimate depth of 1 500 metres.

The Sullivan open-pit mine was reactivated in 1980, and from start of preparation in April until late November, approximately 300 000 tonnes of ore was mined. Small air-track drills worked on a 7.6-metre bench height and a 7.6-metre berm width. Stripping ratio in 1980 was 0.33 to 1.

At the concentrator, crushing capacity of 9 100 tonnes per day was increased in 1980 to crush the open-pit ore separately. Capacity of the open-pit circuit was 2 200 tonnes per day. Grinding capacity of 7 330 tonnes per day remained unchanged. A pilot plant for the flotation of cassiterite operated for a brief period in June and July.

Construction began in 1978 of a drainage water treatment plant designed to process 18 000 litres per minute to standards approved by the Pollution Control Branch. This plant was designed to remove dissolved metals from effluents from the mine, iron concentrates pond, and the siliceous tailings pond. It was put in operation in August 1979.

The total number of employees at the end of 1980 was 1 059, including operating, maintenance, and staff.

The most recent Cominco annual report, issued at the April 1980 Annual Meeting, listed the Sullivan mine reserves as 48 980 000 tonnes with a lead-zinc metal content of 10.4 per cent.

Reference: MI 82F/NE-52.

Sullivan Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	2 002 916	Lead concentrates, 91 131 t; zinc, concentrates, 151 683 t; tin concentrates, 491 t containing 24 868 kg of tin	5 132	73 570 507	437 533	68 047 946	75 418 513	34 701
1976	2 124 886	Lead concentrates, 109 140 t; zinc concentrates, 125 t containing 66 183 kg of tin	—	64 586 617	—	77 065 578	77 435 404	—
1977	2 194 222	Lead concentrates, 106 264 t; zinc concentrates, 426 t containing 181 278 kg of tin	—	89 609 454	—	75 125 898	76 890 967	—
1978	2 107 889	Lead concentrates, 134 270 t; zinc concentrates, 119 716 t; tin concentrates, 561 t containing 236 339 kg of tin	—	114 039 161	—	88 883 212	84 417 720	—
1979	2 047 728	Lead concentrates, 142 223 t; zinc concentrates, 130 512 t; tin concentrates, 549 t containing 207 095 kg of tin	—	107 342 730	—	92 146 698	70 745 854	—
1980	2 132 416	Lead concentrates, 115 714 t; zinc concentrates, 94 918 t; tin concentrates, 236 t containing 113 056 kg of tin	—	88 384 417	—	78 095 523	51 804 218	—

RUTH VERMONT (Fig. M-2, NTS 82, No. 7)

Golden M.D. Lat. 50°57′ Long. 116°59′ (82K/15W)

This property is 40 kilometres southwest of Golden, on Vermont Creek, a tributary of Vowell Creek. It consisted in 1976 of 43 Crown-granted and recorded mineral claims.

It is owned by Consolidated Columbia River Mines Ltd., company office, 73 Water Street, Vancouver V6B 1A1.

The property is an old one and was acquired by the above company in 1965, when a considerable amount of work was done. A mill was later built, and production ensued for a time. Following closure, the mine was reopened in June to December of 1973. In January 1974 snowslides from both sides of the valley caused extensive damage. Reopened in 1975, with a concentrator capacity of 600 tonnes per day, the mine again closed in December 1976 from fear of snowslides. There has been no production since.

Mineralization is in numerous narrow veins crossing strata of the Horsethief Creek Group. A prominent band of limestone, 9 to 15 metres thick, known as the Ruth limestone, is replaced by sulphides in zones closely controlled by fracturing.

Mining in 1976 was on the 6000 level and ore was transferred to the 5750 level to be trammed to the concentrator. Stoping was also started on the Pine Tree vein.

Clean-up at the concentrator in 1978 and 1979 yielded 98 tonnes of lead and zinc concentrates.

References: *Minister of Mines, B.C.*, Ann. Rept., 1966, p. 230; MI 82K/NE-9.

Ruth Vermont Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	10 258	Lead concentrates, 356 t; zinc concentrates, 342 t	453	1 110 086	3 414	210 279	217 213	1 385
1976	60 752	Lead concentrates, 1 504 t; zinc concentrates, 2 244 t	2 830	5 025 312	14 435	949 099	1 276 240	9 003
1978	62	Clean-up; lead concentrates, 20 t; zinc concentrates, 42 t	—	75 083	384	13 600	21 901	166
1979	36	Clean-up; lead concentrates, 34 t; zinc concentrates, 2 t	26	20 964	—	3 961	5 459	—

BURNT BASIN (Fig. M-2, NTS 82, No. 8)

Greenwood M.D. Lat. 49°10.5′ Long. 118°07.5′ (82E/1E)

This old group of Crown-granted claims, including Burnt Basin, Halifax, and Eva Bell, lies west of No. 3 Highway, about 15 kilometres by road east of Christina Lake. It is owned by Donna Mines Ltd., 1105—64th Avenue, Delta, and work was under the direction in 1977 of Paulson Mines Ltd. of the same address.

A small crew shipped 786 tonnes of ore in 1975, and 573 tonnes in 1976 to the HB concentrator and to the Reeves MacDonald concentrator, respectively.

In 1977, three BQ holes were diamond drilled 182 metres on the Halifax and four BQ holes 175 metres on the Eva Bell.

Reference: MI 82E/SE-81, 99, 102, 169.

Burnt Basin Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	786	Lead concentrates, 25 t; zinc concentrates, 98 t	—	49 235	—	23 223	37 825	253
1976	573	Lead concentrates, 33 t; zinc concentrates, 58 t	—	35 209	—	18 714	27 697	142

HIGHLAND BELL (Fig. M-2, NTS 82, No. 9)

Greenwood M.D. Lat. 49°26′ Long. 119°04′ (82E/6E)

The mine is on the western slopes of Wallace Mountain; the lowest or 2900 haulage adit is about 2 kilometres from the office at Beaverdell. Other haulage adits are the 3650 and 3800 levels. The concentrator is on the flat below Beaverdell.

The owner is Teck Corporation; executive office, 1177 West Hastings Street, Vancouver; mine office, Beaverdell.

The orebodies are in a vein system in altered granodiorite, the alteration being most intense in the vein walls. There has been extensive block faulting, with production of many vein segments, creating problems in development and mining. The mine is one of the oldest in the district, having produced silver ore since 1916 almost without interruption. A 50-tonne mill was built in 1950.

From 1975 to 1977 mining consisted almost entirely of salvage work on pillars and in abandoned stopes. In 1978, exploration and development work was done under the Accelerated Mineral Development Program, and about a year and a half's additional reserve of ore was reported to have been established by this work. The concentrator treated an average of 34 450 tonnes per year from 1975 to 1979 and in 1980 the year's tonnage increased to 39 457 tonnes. Ore was trucked from mine portals to the mill, and concentrates were trucked to the Trail smelter. A yealy average of 37 employees was increased to 46 in 1980.

References: *Minister of Mines, B.C.*, Ann. Rept., 1949, pp. 145–148; MI 82E/SW-30, 72, 133.

Highland Bell Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	34 898	Lead concentrates, 704 t; zinc concentrates, 239 t; jig concentrates, 33 t	4 852	11 131 172	—	132 745	136 173	1 304
1976	34 447	Lead concentrates, 733 t; zinc concentrates, 299; jig concentrates, 103 t	5 536	11 583 379	—	147 978	186 168	1 219
1977	33 977	Lead concentrates, 572 t; zinc concentrates, 245 t; jig concentrates, 121 t	5 443	12 030 423	328	122 710	139 565	723
1978	36 280	Lead concentrates, 439 t; zinc concentrates, 403 t; jig concentrates, 121 t	4 012	11 333 062	885	105 933	139 279	977
1979	33 684	Lead concentrates, 388 t; zinc concentrates, 398 t; jig concentrates, 97 t	4 199	10 258 637	613	93 324	140 679	1 000
1980	39 457	Lead concentrates, 333 t; zinc concentrates, 386 t; jig concentrates, 98 t	3 359	10 757 821	389	93 278	145 325	1 080

DENERO GRANDE, JEWEL (Fig. M-2, NTS 82, No. 10)

Greenwood M.D. Lat. 49°09.5′ Long. 118°37′ (82E/2E)

This old property of 10 Crown-granted mineral claims is southeast of the southern end of Jewel Lake, 8 kilometres northeast of Greenwood. It is owned by W. E. McArthur of Greenwood, and work was done on it in 1975 by Colt Resources Ltd., 475 Howe Street, Vancouver.

In the claim area, an epithermal quartz vein containing gold and silver tellurides and galena cuts a granodiorite intrusion in contact with altered volcanic rocks and quartzites. In 1975, 80 metres of drifting was done on the 250 level, and 62 metres of sub-drifting. An emergency escapeway raise was driven to surface. Open stoping was done, with lower grade sections of the vein left as pillars. A total of 1 859 tonnes of siliceous ore was shipped to the Trail smelter.

Work stopped in September pending economic studies.

Reference: MI 82E/SE-55.

Denero Grande, Jewel Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	1 859	Crude ore	17 698	108 643	—	4 912	2 122	—

PHOENIX (Fig. M-2, NTS 82, No. 11)

Greenwood M.D. Lat. 49°06′ Long. 118°36′ (82E/2E)

This property of some 200 Crown-granted and recorded mineral claims is at the now vanished town of Phoenix, approximately 5.5 kilometres east of Greenwood. The original mine workings were on the Old Ironsides and Knob Hill Crown-granted claims.

The Phoenix mine pit closed in August 1976, marking the end of an important era in British Columbia mining history. It was the third major Granby operation to close, finally; the other two were at Anyox and Copper Mountain.

At the time of closure in 1978 the Phoenix mining operation was owned by Granby Mining Corporation, which merged in 1979 to form Zapata Granby Corporation. The latter company was acquired by Noranda, and the name changed in 1980 to Zapata Canada Incorporated.

The original mineral discovery at Phoenix was made in 1891, when the Old Ironsides and Knob Hill were located, and development of these and nearby mineral claims soon started. The Granby smelter at Grand Forks was blown in in the fall of 1900 and ore was brought to it by the forerunner of the Canadian Pacific Railway from the Old Ironsides and Knob Hill mining companies, all with interlocking ownerships, soon to become The Granby Consolidated Mining, Smelting and Power Company Limited. The first ore shipments were at the rate of 700 tonnes per day, and increased to almost 4 500 tonnes per day on completion of a second rail connection by the Great Northern Railway in 1904. Production came first from the above-mentioned claims and later also from the Gold Drop, Snowshoe, Rawhide, and other claims, chiefly the Gold Drop.

The early underground workings were augmented by glory holes and open pits, and the combined operations were suspended in June, 1919, due to a strike in the Fernie coalfields and due to exhaustion of the orebodies under the then existing conditions. The property remained idle for many years until W. E. McArthur, Senior acquired much of the ground and mined relatively small bodies of higher than average grade, shipping to a small concentrator that he controlled, on the outskirts of Greenwood. This work was done in the late 1930's and early to mid 1940's.

In 1956 a reappraisal was made of the old mine with a view to open-pit mining, a 540-tonne-per-day concentrator was built close to the mine, and open-pit production started in 1959. Exploration being successful, the mill capacity was increased to 810 tonnes the following year. Continued exploration added to the reserves so that the capacity was raised in 1964 to 1 710 tonnes, and in 1972 to the final rated capacity of 2 485 tonnes per day.

In August, 1976 the Granby mining operation at Phoenix came to an end for the second and last time, although the mill continued to treat low-grade stockpiled ore. In 1977, 832 583 tonnes of stockpiled ore with a grade of 0.386 per cent copper was milled, leaving an estimated reserve of 115 000 tonnes grading 0.37 per cent copper. In 1978, a total of 237 801 tonnes of low-grade Phoenix ore was milled, together with 290 724 tonnes of ore from the Lone Star mine in northern Washington. All operations ceased on October 4, 1978, and all assets were sold at public auction on October 31, 1978.

At the close of operations, four spillways were constructed around the various water impoundments at the site, to accord with recommended guidelines. Some reclamation work, such as grading waste dumps, spreading topsoil, fertilizing, and seeding, continued into 1979.

The total production of the Granby company from Phoenix follows. Ore shipped to the smelter at Grand Forks from 1900 to 1919; ore concentrated in 1959 and subsequently.

1900–1919: 12 434 620 tonnes mined—Gross metal content:
Gold, 29 890 333 grams
Silver, 129 614 194 grams
Copper, 163 550 454 kilograms

1959–1978: 9 070 560 tonnes mined—Gross metal content in concentrates:
Gold, 7 258 879 grams
Silver, 52 579 405 grams
Copper, 71 587 498 kilograms

Reference: MI 82E/SE-20, 21.

Phoenix Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	985 875	Copper concentrates, 15 797 t	366 978	3 657 215	4 220 275	—	—	—
1976	985 845	Copper concentrates, 15 435 t	364 620	3 261 367	4 231 780	—	—	—
1977	832 583	Copper concentrates, 10 226 t	288 238	1 748 891	2 695 517	—	—	—
1978	237 801	Copper concentrates, 2 645 t	120 555	924 599	912 728	—	—	—

RIVERSIDE (Fig. M-2, NTS 82, No. 12)

Greenwood M.D. Lat. 49°06.7′ Long. 118°58.2′ (82E/2W)

The Riverside and other Crown-granted mineral claims are on the east bank of the Westkettle River, 16 kilometres north of the village of Rock Creek. They were held by lease in 1980 by Dee Lil Resources Ltd., Rock Creek; S. Kemaleddine, Manager.

The property was included in an adjoining recreational park, when the park boundaries were extended under an Order in Council. Subsequently, a conflict of interests existed when the Riverside adit was reopened and a total of 500 tonnes was mined and stockpiled. A shipment of 85 tonnes was made in 1979 and 8 tonnes in 1980.

In 1980 a small mill was assembled but was not in use. It has since been reported, by the owner of the claims, that the mill was vandalized and the equipment returned to the original owner.

A cease and desist order by the Chief Inspector was still in effect on this property at the end of 1980.

Reference: MI 82E/SE-114.

Riverside Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1979	85	Crude ore	93	16 880	—	460	591	—
1980	8	Crude ore	61	303	—	17	2	—

SKOMAC (Fig. M-2, NTS 82, No. 13)

Greenwood M.D. Lat. 49°03.5′ Long. 118°42′ (82E/2E)

Robert Mines Ltd.; K. Schindler, President.

This old property is just north of Boundary Falls, 5.5 kilometres south of Greenwood. A few carloads of ore was mined in 1904, and 670 tonnes was shipped in 1962–64 by Skomac Mines Ltd. The present company gained control in 1974 and shipped 434 tonnes of ore in 1975 and 548 tonnes in 1976.

The vein system dips northeastward, mainly in black argillite of the Skomac Formation, near a contact with intrusive grandiorite-diorite, from which numerous dykes and tongues cut the metasedimentary rocks.

In 1977, some geochemistry and geological mapping was done and seven holes totalling 245 metres were diamond drilled.

References: *Minister of Mines, B.C.*, Ann. Rept., 1964, p. 110; *B.C. Ministry of Energy, Mines & Pet. Res.*, Geological Fieldwork, 1976, Paper 1977-1, pp. 9, 10; MI 82E/SE-172, 173, 174, (Nonsuch, Last Chance, Republic).

Skomac Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	434	Crude ore	2 146	301 606	—	13 067	8 439	—
1976	548	Crude ore	1 327	221 355	—	16 122	8 651	—

AFTON (Fig. M-2, NTS 92, No. 14)

Kamloops M.D. Lat. 50°39.5′ Long. 120°30.5′ (92I/10E)

The Afton mine is alongside the Trans-Canada Highway, 13 kilometres west of Kamloops, at 640 metres elevation. Afton Mines Ltd., controlled by Teck Corporation since 1975, merged in 1981 with that corporation, 1199 West Hastings Street, Vancouver, V6E 2K5.

Copper mineralization has been known in this region for many years, and part of the Afton orebody is on a Crown-granted mineral claim located in 1904. The present Afton claims were located in 1949 and surface drilling was done in subsequent years. In 1971 C. F. Millar, for Afton Mines Ltd., drilled percussion holes that discovered the Afton porphyry copper orebody.

Decision for production was reached in 1975, and in 1976 plant construction and pit preparation were started. The open pit was in operation from April 1977, an 8 000-tonne-per-day concentrator started up in December 1977, and a smelter (a top blown rotary converter) was blown in in March 1978. Capacity operation was attained in March 1979.

The orebody is at the northwestern extremity of the Iron Mask batholith, a subvolcanic multiple intrusion ranging from diorite to syenite. Ore occurs in late-phase plutonic rocks, including latite porphyry and related breccias. Hypogene ore contains fine-grained bornite and chalcopyrite and blebs and veinlets of those minerals. Supergene ore extends to a depth of some 400 metres, and contains metallic copper and chalcocite. Company figures in 1976 gave, to an explored depth of 600 metres, a reserve of 30.84 million tonnes of open-pit ore grading 1.0 per cent copper with a 0.25 per cent copper cutoff. Most of this was supergene, enriched ore.

In 1980 the concentrator treated 7 500 tonnes per calendar day, and the smelter produced 22 510 tonnes of blister copper. Because of the presence of metallic copper, gravity treatment was employed in addition to flotation.

Water was pumped from Kamloops Lake and was partly reclaimed. Tailings were impounded at Hughes Lake. Pollution control and reclamation were planned from the start of operations.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, GEM, 1972, pp. 209–220; *CIM*, Porphyry Deposits of the Canadian Cordillera, 1976, pp. 376–387; MI 92I/NE-23.

Afton Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1977	122 340	....	—	—	—	—	—	—
1978	2 456 757	Copper concentrates, 18 176 t; blister copper, 5 995 t	1 022 791	5 524 701	15 429 468	—	—	—
1979	2 822 850	Copper concentrates, 10 249 t; blister copper, 19 827 t	1 860 022	9 365 673	25 611 766	—	—	—
1980	2 739 799	Copper concentrates, 5 058 t; blister copper, 22 510 t	1 431 195	8 859 577	24 221 282	—	—	—

BETHLEHEM (Fig. M-2, NTS 92, No. 15)

Kamloops M.D. Lat. 50°29.5′ Long. 120°59′ (92I/7W)

The Bethlehem porphyry copper-molybdenum deposit is on the north side of the Highland Valley, 48 kilometres southeast of Ashcroft. It is the first such mine to be operated in the district, having been in production since December 1962.

It is owned by Bethlehem Copper Corporation, 1055 West Hastings Street, Vancouver; mine office, Box 520, Ashcroft (a subsidiary of Cominco Ltd. since February 1981).

Four orebodies have been mined by open pit: the East Jersey (mined prior to 1975), Jersey, Huestis, and Iona deposits. They are largely within the Bethlehem (younger) phase of the Guichon Creek granodiorite batholith at the irregular intrusive contact between these phases. Mineralization is located particularly in areas of explosion breccia and intrusive dacite porphyry dykes which are part of a north-trending dyke swarm 34 kilometres long. The Huestis zone contains very little breccia and few dykes; in it the ore is fracture controlled.

The Bethlehem orebodies exhibit zoning of metallic and non-metallic minerals. Peripheral zones of specularite and epidote, and intermediate zones of pyrite and white mica surround a central copper-rich core defined by relatively large amounts of bornite and secondary biotite.

The Jersey pit was developed later than the East Jersey, and when it was several hundred feet deep the Huestis pit was started in 1971. The Iona pit was developed in 1976. The Huestis pit was mined out in 1976, when the Jersey pit was redeveloped.

The Huestis pit was backfilled from 1977 to 1980. In 1980 the Jersey pit was being extended to the southeast, with the intention of merging it with the Iona pit.

Mining was by standard open-pit methods. The concentrator operated at a daily rate of about 1 800 tonnes. Molybdenum concentrate was produced by treatment of the copper concentrate, and in 1978 a new molybdenum circuit was added to the concentrator.

Copper concentrates were trucked to Clinton for rail shipment to Vancouver. Molybdenite concentrates were packed in drums of approximately 318 kilograms each and truck-hauled to Vancouver.

References: *CIM*, Porphyry Deposits of the Canadian Cordillera, 1976, pp. 105–119; MI 92I/SE-1, 2, 4, 6.

Bethlehem Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	5 864 500	Copper concentrates, 66 257 t	20 061	4 206 432	22 154 586	—	—	—
1976	6 763 836	Copper concentrates, 64 781 t	57 230	4 618 236	23 006 380	—	—	—
1977	5 554 855	Copper concentrates, 56 531 t	106 652	7 778 580	24 482 130	—	—	—
1978	6 490 726	Copper concentrates, 41 580 t; molybdenite concentrates, 269 t containing 133 777 kg of molybdenum	124 661	7 299 470	18 312 007	—	—	—
1979	6 525 449	Copper concentrates, 51 339 t; molybdenite concentrates, 592 t containing 306 286 kg of molybdenum	122 797	6 535 338	21 260 613	—	—	—
1980	6 261 765	Copper concentrates, 75 512 t; molybdenite concentrates, 173 t containing 93 299 kg of molybdenum	129 204	6 503 270	22 715 445	—	—	—

HIGHMONT (Fig. M-2, NTS 92, No. 16)

Kamloops M.D. Lat 50°26′ Long. 121°00′ (92I/6E, 7W)

This porphyry copper-molybdenum property of 202 mineral claims is in the Highland Valley, 42 kilometres southeast of Ashcroft. It is owned by Teck Corporation, 1199 West Hastings Street, Vancouver V6E 2K5.

Detailed examinations of this ground started in the late 1950's. In 1962 Torwest Resources (1962) Limited acquired the property and drilled 20 holes. Highmont Mining Corp. Ltd. was formed in 1966 and started extensive diamond and percussion drilling with encouraging results. Underground sampling was financed initially by Nippon Mining Company, who withdrew. In 1969 Teck Corporation entered into an agreement with Highmont that included the right to finance the property to production, and in 1979 absorbed the earlier company. Production started December 19, 1980 and reached full capacity of 25 000 tonnes per day three months later.

Seven copper-molybdenum deposits are known on the property, most of which are in Skeena quartz diorite, a phase of the Guichon Creek batholith. The four largest deposits or orebodies are on either side of and near a west-trending composite dyke about 200 metres wide. The dyke is mainly quartz porphyry and contains local zones of tourmalinized breccia. Sulphide mineralization occurred after intrusion of the dyke, but chiefly prior to brecciation and continued until after intrusion of later aplite dykes. Zones dominated by bornite, by chalcopyrite, and by chalcopyrite plus pyrite are roughly parallel to the composite dyke. Hydrothermal alteration at Highmont is comparatively weak.

Production started in the largest, or No. 1, orebody, which had a reserve (1976) of 111 million tonnes of ore grading 0.287 per cent copper and 0.042 per cent molybdenum. The concentrator operated in December, but there was no recorded production in 1980.

References: *CIM*, Porphyry Deposits of the Canadian Cordillera, 1976, pp. 163–181; MI 92I/SE-13, 88, 152; 92I SW-36.

LORNEX (Fig. M-2, NTS 92, No. 17)

Kamloops M.D. Lat. 50°27′ Long. 121°03′ (92I/6E)

The Lornex porphyry copper-molybdenum deposit is in the Highland Valley, 42 kilometres southeast of Ashcroft. The property of about 500 mineral claims and fractions is on the south side of the valley between 1 300 and 1 525 metres in elevation. This is an extensive open-pit operation with a milling capacity of about 48 000 tonnes per day.

It is owned by Lornex Mining Corp. Ltd., 120 Adelaide Street West, Toronto M5H 1W5; mine office, Box 1500, Logan Lake V0K 1W0.

The Lornex ore zone is approximately 1 900 metres long and 500 metres wide, and is entirely within Skeena quartz diorite, a variety of the Bethlehem phase of the Guichon Creek batholith. The host rock is intruded by a pre-mineral quartz-porphyry dyke, most prominent in the southern part of the ore zone. The northwest boundary of the zone is the Lornex fault, a west-dipping regional structure.

Mineralization is fracture-controlled, and commonly occurs as fracture coatings or veins. The major sulphides are chalcopyrite, bornite, molybdenite, and pyrite. Sulphide minerals and hydrothermal alteration zones are distributed in a roughly concentric pattern, with a bornite core and surrounding chalcopyrite and molybdenite; pyrite is peripheral. Intensity of hydrothermal alteration, and sulphide content, increase with fracture density.

The Lornex orebody is believed to have formed at the intersection of regional structures where conjugate shears were formed.

Mining was by conventional open-pit methods, utilizing rotary drills, electric shovels, and diesel-electric trucks. Ore was trucked to a gyratory crusher, crushed and stockpiled. It was then reclaimed, milled, and a bulk flotation concentrate produced, which was further treated to produce a copper and a molybdenum concentrate. Tailings were conveyed by a 10 253-metre gravity pipeline to a valley tailings pond contained between three dams.

Ore reserves at the end of 1980 were reported as approximately 454 million tonnes grading 0.382 per cent copper and 0.0148 per cent molybdenum.

References: *B.C. Dept. of Mines & Pet. Res.*, GEM, 1970, pp. 354–369; CIM, Porphyry Deposits of the Canadian Cordillera, 1976, pp. 120–129; MI 92I/SW-45.

Lornex Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	11 696 413	Copper concentrates, 154 294 t; molybdenite concentrates, 2 608 t, containing 1 406 082 kg of molybdenum	7 745	130 042 545	50 239 447	—	—	—
1976	15 436 575	Copper concentrates, 204 020 t; molybdenite concentrates, 3 133 t containing 1 715 590 kg of molybdenum	26 851	17 316 751	68 313 748	—	—	—
1977	15 480 725	Copper concentrates, 204 448 t; molybdenite concentrates, 3 427 t containing 1 846 840 kg of molybdenum	12 597	19 209 555	66 156 450	—	—	—
1978	15 927 064	Copper concentrates, 206 799 t; molybdenite concentrates, 3 459 t containing 1 864 355 kg of molybdenum	—	17 486 200	63 114 028	—	—	—
1979	16 126 103	Copper concentrates, 194 829 t; molybdenite concentrates, 3 818 t containing 2 059 851 kg of molybdenum	—	16 562 009	60 858 558	—	—	—
1980	16 037 591	Copper concentrates, 203 271 t; molybdenite concentrates, 2 903 t; molybdic oxide, 1 118 t; ferro-molybdenum, 83 t containing 2 166 136 kg of molybdenum	—	18 372 886	63 431 872	—	—	—

OK (Fig. M-2, NTS 92, No. 18)

Kamloops M.D. Lat. 50°29′ Long. 121°06′ (92I/6E)

This old property of 124 mineral claims is in the Highland Valley, 40 kilometres south-southeast of Ashcroft. It is also known as the Alwin from a company that developed the mine but ceased milling in 1972.

It is owned by DeKalb Mining Corporation, 630 Sixth Avenue SW., Calgary T2P 0S8.

This is a vein deposit in Bethsaida granodiorite, a phase of the Guichon Creek batholith. The veins are sericitized shear zones, 1 to 10 metres wide, mineralized with chalcopyrite and bornite and minor primary chalcocite. Overall, six ore zones are contained in a band

150 by 4 500 metres long. The ore zones pinch, swell, and digitate, there are pre-ore porphyry dykes and postmineral faulting. The structural pattern is complex.

The mine is developed by declines and by a main haulage adit at 1 560 metres elevation.

Exploratory and development work was done in 1975 and later years, under different regimes. The mine produced 48 223 tonnes and concentration began in 1980, with full production anticipated at 18 000 tonnes per month.

References: *B.C. Dept. of Mines & Pet. Res.*, GEM, 1972, pp. 155–157; MI 92I/SW-10.

ERICKSON (Fig. M-2, NTS 104, No. 19)

Liard M.D. Lat. 59°13.5′ Long. 129°38.8′ (104P/4E)

This property of five mineral claims is 12 kilometres southeast of Cassiar. It is owned by Erickson Gold Mining Corporation, 203, 1209 East Fourth Street, North Vancouver V7J 1G8; mine office, Box 660, Cassiar.

Gold and silver values in the Jennie quartz vein are contained in metallic gold, pyrite, tetrahedrite, chalcopyrite, and small amounts of galena and sphalerite. The vein is from a few centimetres to 9 metres wide, with an average of 1 metre. Enclosing rocks are interbedded volcanic and sedimentary. A fine-grained dyke parallels the vein.

The mine went into production in April 1979, in which year approximately 29 000 tonnes of ore was milled.

In 1980, development of the mine proceeded, and 7 775 metres of surface diamond drilling was done. Work started on new surface shops, and expansion of the concentrator to a capacity of 250 tonnes per day.

Reference: MI 104P-29.

Erickson Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1979	28 896	Gold concentrates, 401 t	574 668	567 763	—	—	—	—
1980	28 804	Gold concentrates, 561 t	484 662	—	—	—	—	—

MAGNUM (Fig. M-2, NTS 94, No. 20)

Liard M.D. Lat. 58°31′ Long. 125°24′ (94K/11W)

At the headwaters of Delano Creek, 210 kilometres by road south and west of Fort Nelson. It is 56 kilometres by road south of Mile 401 on the Alaska Highway. The property was owned by Consolidated Churchill Copper Corporation Ltd., which company passed into the control of Teck Corporation in 1979, and no longer exists.

The ore deposit consists of quartz-ankerite veins in a steeply dipping zone, as much as 90 metres wide, of crumpled non-limy strata in a succession of limy Precambrian sedimentary rocks. The veins for the most part strike north 35 degrees east and dip steeply. As many as 10 veins follow the zone and a few others branch from it or occur with other orientations. The veins are as much as 7.6 metres wide. Postmineral diabase dykes follow the zone and are closely associated with the veins; in places a vein and parts of an ore shoot may be obliterated by a dyke. The relations between crumpling and alteration, shearing, faulting, vein formation, and dyke intrusion in the mineral zone are complex in detail and point to a long evolutionary process that was not a simple one.

The property was brought into production in April 1970. Operations were suspended on October 1, 1971 and resumed in January 1974 at a milling rate of 500 tonnes per day, with financing and management provided by Kam-Kotia Mines Ltd. of Toronto. Ore was mined by shrinkage stoping and milled at the company's concentrator on the Racing River; the concentrates were trucked to Fort Nelson.

Operations ceased in March 1975, all mine entrances were sealed, and the concentrator and other buildings were put up for sale.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, GEM, 1971, pp. 81–89; MI 94K-3.

Magnum Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	—	Copper concentrates, 2 887 t	—	—	806 665	—	—	—

BRALORNE (Fig. M-2, NTS 92, No. 21)

Lillooet M.D. Lat. 50°46′ Long. 122°48′ (92J/15W)

This former gold-producing property of 133 mineral claims is on Cadwallader Creek, 112 kilometres by road from Lillooet via the Bridge River valley. It is owned by Bralorne Resources Limited, 205 Fifth Avenue SW., Calgary T2P 2V7.

Production ceased in September 1971. Since that time reappraisal and feasibility studies have been made, chiefly in 1974, when extensive exploration was done through No. 8 level and the Crown shaft.

In September 1980 surface and underground studies were begun by E & B Explorations Ltd. By year-end 4 572 metres of surface diamond drilling had been done, and a limited amount of underground drilling, sampling, and mapping had been accomplished. A crew of 15 was employed.

Small shipments were made of clean-up material from the old concentrator.

Reference: MI 92J-1, 2.

Bralorne Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1978	149	Clean-up	14 992	4 976	—	150	150	—
1980	6	Clean-up	404	124	—	7	7	—

ISLAND COPPER (Fig. M-2, NTS 92, No. 22)

Nanaimo M.D. Lat. 50°36′ Long. 127°28.3′ (92L/11W, 12E)

This porphyry copper-molybdenum mine is 16 kilometres south of Port Hardy on the north shore of Rupert Inlet.

It is owned by Utah Mines Ltd., a Canadian subsidiary of Utah International Inc. of San Francisco; mine office, Box 370, Port Hardy V0N 2P0; Vancouver office, 1050 West Pender Street V6E 3S7.

The orebody in plan is an elongated ellipse, subparallel to the regional trend. It occurs within rocks of the Bonanza Group, including coarse to fine andesitic to dacitic breccias and tuffs, dipping to the south. Intrusive into the volcanic rocks is an irregular dyke of quartz-feldspar porphyry dipping from 45 to 60 degrees to the north, almost at right angles to the dip of the Bonanza rocks. The orebody is draped about the dyke.

The ore zone is strongly fractured, the ore minerals chalcopyrite and molybdenite occurring in hair-like veinlets for the most part. About 75 per cent of the ore is in volcanic rocks, and the remainder, on both sides of the dyke, is in marginal breccia. Most of the unbrecciated porphyry is not mineralized.

Contact metamorphism forms broad zones parallel to the dyke. Wallrock alteration of generally chlorite-sericite type is closely related to fracturing and brecciation.

Production began late in 1971 from the open pit, and in 1980 was at a rate of 40 000 tonnes of ore daily, with a stripping ratio of 3:1. In 1980 there were 18 benches in the pit, from 100 metres above sea level to 122 metres below. Copper concentrates were loaded from deep-sea docks to ocean going vessels. Molybdenite concentrates were shipped by barge to Vancouver.

From the start of operations, tailings from the concentrator have been discharged into Rupert Inlet. Effects upon the water, sea bottom, and all forms of sea life have been carefully monitored, and the data have been studied by many agencies and groups.

References: *CIM*, Porphyry Deposits of the Canadian Cordillera, 1976, pp. 206–218; MI 92L-158.

Island Copper Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	12 075 145	Copper concentrates, 201 322 t; molybdenite concentrates, 1 485 t containing 615 313 kg of molybdenum; rhenium shipments are confidential	1 705 595	8 996 170	47 514 467	—	—	—
1976	12 246 885	Copper concentrates, 213 588 t; molybdenite concentrates, 2 145 t containing 878 072 kg of molybdenum; rhenium shipments are confidential	1 416 958	9 983 690	48 956 470	—	—	—
1977	13 106 006	Copper concentrates, 202 558 t; molybdenite concentrates, 2 302 t containing 987 627 kg of molybdenum; rhenium shipments are confidential	1 496 459	9 699 222	46 748 860	—	—	—
1978	14 200 203	Copper concentrates, 218 515 t; molybdenite concentrates, 2 087 t containing 859 104 kg of molybdenum; rhenium shipments are confidential	1 345 360	10 402 740	50 853 152	—	—	—
1979	13 339 997	Copper concentrates, 218 490 t; molybdenite concentrates, 2 705 t containing 1 111 400 kg of molybdenum; rhenium shipments are confidential	1 684 627	10 994 861	50 254 743	—	—	—
1980	13 782 249	Copper concentrates, 219 405 t; molybdenite concentrates, 2 703 t containing 1 113 074 kg of molybdenum	1 747 704	13 456 484	50 033 433	—	—	—

TEXADA (Fig. M-2, NTS 92, No. 23)

Nanaimo M.D. Lat. 49°42′ Long. 124°32′ (92F/10E)

This mine is at Welcome Bay on the southwest coast of Texada Island, 12 kilometres by road south of Vananda. It was owned and operated by Texada Mines Ltd.

The orebodies are contact skarn deposits on the northern margin of the Gillies granodiorite stock. Several orebodies were known, with differing relationships to skarn, granodiorite porphyry, volcanic rocks, and limestone. A small amount was mined by open pit in 1975–76.

Mining by open pit began in early 1952 and ended in late 1964. The operation then went underground and continued by longhole mining at a rate of about 4 000 tonnes per day. Magnetic iron ore concentrates were shipped to Japan. Lesser amounts of copper concentrates were also produced.

In 1976 contracts for sale of iron and copper concentrates to Japan terminated, and short-term contracts for iron concentrates were not forthcoming. The concentrator was closed on December 23, 1976, and all equipment, pipe, rail, and buildings were sold by public auction at the plant site, August 25, 1977.

Production, from 1952 to 1976 amounted to 10 329 379 tonnes of iron concentrates and 131 702 tonnes of copper concentrates.

References: *Minister of Mines, B.C.*, Ann. Rept., 1964, pp. 146–151; MI 92F-106, 258.

Texada Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	906 730	Iron concentrates, 296 250 t; copper concentrates, 7 426 t	45 597	1 385 359	1 635 716	—	—	—
1976	848 477	Iron concentrates, 368 412 t; copper concentrates, 6 394 t	33 687	1 337 149	1 332 202	—	—	—

GOLD BELT (Fig. M-2, NTS 82, No. 24)

Nelson M.D. Lat. 49°09.5′ Long. 117°07.4′ (82F/3E)

This former producer is in the Sheep Creek camp, 12 kilometres southeast of Salmo. The property of 39 Crown-granted mineral claims is owned by Gold Belt Mines Inc., 318 Homer Street, Vancouver V6B 2V3.

Gold-bearing quartz veins occur in Nugget quartzite within the Sheep Creek anticline.

In 1979 a crew of 16 rehabilitated the mine and did some developmental work. A total of 1 010 tonnes of ore was shipped to the Trail smelter.

Reference: MI 82F/SW-44, 56.

Gold Belt Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1979	1 010	Crude ore	9 860	21 275	681	7 564	3 927	—

HB (Fig. M-2, NTS 82, No. 25)

Nelson M.D. Lat. 49°09′ Long. 117°12′ (82F/3E)

The HB mine is on the north side of the valley of Sheep Creek, 10.5 kilometres by road southeast of Salmo. It is owned by Cominco Ltd.

Lead-zinc ore is localized within dolomitized Reeves limestone, as steeply dipping stringers and flat-lying breccia zones.

Ore production began at a concentrator capacity of 1 000 tonnes per day in 1955. Closed owing to low metal prices in October 1966, operations resumed in February 1973 and continued until the mine and plant closed permanently on August 17, 1978.

During the life of the mine, 6 627 528 tonnes of ore was produced, with an average grade of 0.93 per cent lead and 4.45 per cent zinc.

Reference: MI 82F/SW-4, 249.

HB Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	411 084	Lead concentrates, 4 950 t; zinc concentrates, 22 878 t	822	1 130 314	—	1 866 762	12 480 257	96 325
1976	374 163	Lead concentrates, 5 062 t; zinc concentrates, 23 106 t	684	937 071	274	2 036 925	12 796 512	104 523
1977	357 256	Lead concentrates, 4 831 t; zinc concentrates, 22 606 t	—	996 696	615	1 931 566	12 593 518	95 893
1978	200 888	Lead concentrates, 3 900 t; zinc concentrates, 15 264 t	—	827 713	—	1 451 180	8 381 566	67 298

MOTHER LODE and NUGGET (Fig M-2, NTS 82, No. 26)

Nelson M.D. Lat. 49°09.8′ Long. 117°06.8′ (82F/3E)

This property is in the Sheep Creek camp, 17 kilometres by road southeast of Salmo. It is owned by S. A. Endersby, 1124 Lee Street, White Rock.

Gold-bearing quartz veins occur in quartzites of the Quartzite Range Formation.

In 1975, 484 tonnes of ore and in 1980, 924 tonnes were shipped to Trail from the Mother Lode, Nugget, and Reno. All of this production is believed to have come from old dumps.

Reference: MI 82F/SW-40, 41.

Mother Lode and Nugget Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	484	Siliceous ore, dump clean-up	3 919	34 462	—	—	—	—
1980	435	Crude ore (Mother Lode)	4 429	7 123	—	698	1 028	—
1980	425	Crude ore (Nugget)	4 264	2 877	—	469	435	—

REEVES MacDONALD (Fig M-2, NTS 82, No. 27)

Nelson M.D. Lat. 49°01.5′ Long. 117°22′ (82F/3W)

This property of 71 Crown-granted mineral claims is on the Pend-d'Oreille River, 6 kilometres west of Nelway. It was owned and operated by Reeves MacDonald Mines Limited.

Lead-zinc ore occurs in the Reeves limestone. The main orebody, with a dip length of 300 metres, was developed as the Reeves mine on the north side of the river. A faulted section of the same zone was mined as the Annex mine on the south side of the river.

Operations started in 1948, and production of about 365 000 tonnes per year was attained in the 1960's. In 1971 the Reeves mine ceased production except for clean-up work, and the Annex continued to operate until March 1975.

Concentrates were shipped to the Trail smelter and to the smelter at Kellog, Idaho.

From 1948 to 1975, a total of 6 581 140 tonnes of ore was milled, with gross metal content in concentrates of 64 829 752 kilograms lead, 246 295 639 kilograms zinc, and 53 894 096 grams silver. It is of interest to note that of 763 314 tonnes of ore milled from the Annex, the gross metal content in concentrates was 7 136 974 kilograms lead, 42 679 633 kilograms zinc, and 34 052 093 grams silver.

Reference: MI 82F/SW-219.

Reeves MacDonald Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	32 211	Lead concentrates, 273 t; zinc concentrates, 1 604 t	—	296 847	—	151 543	850 479	7 924

IDAHO (Fig. M-2, NTS 92, No. 28)

New Westminster M.D. Lat. 49°31′ Long. 121°18′ (92H/11W)

Extensive holdings, including eight Crown-granted claims, are on the west fork of Ladner Creek, about 30 kilometres northeast of Hope by road.

The property is owned by Carolin Mines Ltd., 475 Howe Street, Vancouver V6C 2B3; mine office, Box 1697, Hope V0X 1L0.

The Idaho orebody is on the east side of the Coquihalla serpentine belt, along which gold showings, some with spectacular local values, have been known for many years. The present mine is on the Idaho Crown-granted mineral claim, within siltstones of the Ladner Group, about 200 metres east of the faulted serpentine contact.

The mineralization is a hydrothermal replacement of graywacke and coarse silts, involving multistage introduction of material to produce quartz, plagioclase, carbonate, chlorite, pyrrhotite, arsenopyrite, and pyrite, and less magnetite, chalcopyrite, bornite, and gold. Mineralization was emplaced along an early reverse fault that occupies the disrupted limb of an overturned fold. The ore is in an irregular, steeply inclined body approximately 35 metres wide, 100 metres deep, and more than 300 metres long. The body may be termed a quartz-veined shattered zone. Reserves have been reported as 1.4 million tonnes, averaging 5.14 grams gold per tonne.

Development of the mine took place in 1978–80. Two adits and a connecting decline were driven: a main development level at 875 metres elevation and a main haulage level at 815 metres elevation. Track haulage is used on the lower level.

A concentrator, built near the main haulage portal, was designed to treat 1 500 tonnes of ore per day by flotation, to be followed by cyanidation of the concentrates and final production of bullion. Production began in December 1981.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, Geological Fieldwork, 1981, Paper 1982-1, pp. 87–101; MI 92H/NW-3, 7.

Idaho Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1978	8	Crude ore	10	43 389	—	6 284	135	—

CRAIGMONT (Fig. M-2, NTS 92, No. 29)

Nicola M.D. Lat. 50°12.5′ Long. 120°55.7′ (92I/2W)

The mine is 16 kilometres northwest of Merritt; a branch road leaves the highway at Lower Nicola. It is owned by Craigmont Mines Limited, Box 3000, Merritt V0K 2B0, of which company Placer Development is a major shareholder.

The Craigmont orebodies are pyrometasomatic copper deposits mainly in limy bedded rocks, lying within the thermal aureole of the southern end of the Guichon Creek batholith. Alteration of the rock is intense and varies somewhat with the original rock type. The ore is believed to be localized in sedimentary zones characterized by medium to coarse-grained clastic rocks. Bands of limestone are not characteristically mineralized.

The deposit can be termed a skarn because of the intensity of alteration and the presence of iron oxides, either magnetite or hematite, or both.

Mining was by a method of transverse sublevel caving. Ground support was by "shotcreting" and by ¾-inch reinforcing bars grouted into the holes.

Copper concentrates were shipped mainly to Japan. Magnetic iron concentrates were sold to the coal industry for use in heavy media separation.

Reclamation and pollution control were given continuing attention.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, GEM, 1974, pp. 127–130; MI 92I/SE-35.

Craigmont Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	1 774 731	Copper concentrates, 69 996 t; iron concentrates 41 145 t	26 997	—	20 564 778	—	—	—
1976	1 763 219	Copper concentrates, 74 310 t; iron concentrates, 32 564 t	7 836	—	21 107 071	—	—	—
1977	1 884 335	Copper concentrates, 63 193 t; iron concentrates, 36 246 t	—	—	17 659 393	—	—	—
1978	1 899 934	Copper concentrates, 93 082 t; iron concentrates 33 183 t; coarse iron, 2 513 t	—	—	26 290 618	—	—	—
1979	1 924 570	Copper concentrates, 56 631 t; iron concentrates 41 372 t; coarse iron, 3 156 t	—	—	16 186 137	—	—	—
1980	1 950 551	Copper concentrates, 38 649 t; iron concentrates 41 562 t; coarse iron, 2 649 t	13 312	—	10 794 185	—	—	—

BELL (Fig M-2, NTS 93, No. 30)

Omineca M.D. Lat. 55°00.51′ Long. 126°14′ (93M/1E; 93L/16E)

This porphyry copper deposit on two mineral leases and 98 claims is on Newman Peninsula in Babine Lake. Production began in October 1972.

It is owned by Noranda Mines, Limited and is operated as the Babine Division (prior to 1979 as the Bell Copper Division), Box 2000, Granisle V0J 1W0.

The Bell orebody is horseshoe-shaped in plan, dips steeply, and is 150 to 300 metres wide by 1 000 metres long. It follows and overlaps the western and northern edges of an Eocene biotite-feldspar porphyry plug, 800 metres long by 200 to 600 metres wide, which was emplaced along the Newman fault, intruding rocks of the Hazelton Group and Eocene rhyodacite. The ore is almost entirely in porphyry and volcanic rocks and is surrounded by a halo of hydrothermal alteration characterized by biotite in the central zone and by chlorite-carbonate peripherally.

The chief copper mineral is chalcopyrite, but bornite is also present, and enrichment with chalcocite occured in the upper 50 to 70 metres of part of the orebody.

In 1979 a decision was made to increase the pit size to 760 metres by 915 metres, and 300 metres deep; and at the same time to increase the ore treated from 13 600 to 15 400 tonnes per day. This work was completed in 1980. Published ore reserves were, at the end of 1980, approximately 48.5 million tonnes grading 0.51 per cent copper.

Concentrates were loaded onto truck-trailer combinations, transported 3.2 kilometres by barge, then 63 kilometres to rail siding at Topley.

Reference: MI 93M-1.

Bell Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	4 336 048	Copper concentrates, 63 283 t	739 089	2 061 227	16 466 056	—	—	—
1976	1 925 246	Copper concentrates, 25 748 t	295 292	823 265	6 051 253	—	—	—
1977	4 409 135	Copper concentrates, 59 378 t	714 280	2 086 868	15 890 806	—	—	—
1978	4 470 070	Copper concentrates, 64 464 t	763 299	2 210 148	17 144 917	—	—	—
1979	5 073 909	Copper concentrates, 48 456 t	656 601	1 661 368	13 136 524	—	—	—
1980	5 011 943	Copper concentrates, 65 901 t	848 347	2 259 450	17 532 042	—	—	—

CHAPPELLE (Fig. M-2, NTS 94, No. 31)

Omineca M.D. Lat. 57°17′ Long. 127°06′ (94E/6E)

This property is 30 kilometres north of Thutade Lake, between the Toodoggone and Sturdee River valleys, between 1 500 and 1 735 metres elevation.

A large group of mineral claims was owned by Kennco Explorations, (Western) Limited. It was optioned by Conwest Exploration Company Limited in 1973, when a first crosscut was driven. It was optioned in 1974 by DuPont of Canada Exploration Limited, 1550 Alberni Street, Vancouver V6G 1A5, the present operator.

Seven quartz-vein systems, mostly occupying fault zones, have been identified in the mine area. The main vein zone contains two or more sub-parallel veins, in a width of 10 to 70 metres and a vertical depth of at least 150 metres. Individual veins in the zone range in width from 0.5 metre to greater than 9 metres. A variety of textures and crosscutting relationships indicate a complex history of mineralization.

Wallrocks are Takla andesite and dacite. Fine-grained minerals in the highly fractured quartz-vein systems include pyrite, sphalerite, galena, chalcopyrite, bornite, chalcocite with electrum, metallic gold, and acanthite and other silver-bearing minerals.

By 1980 an air strip was completed on the Sturdee River, 320 kilometres north of Smithers, and a road was built 15 kilometres to the mine site. Supplies were brought in by Hercules aircraft in 1980 and construction was completed of a camp, 100-tonne concentrator, power house, water supply, and tailings disposal system. In 1981, production began of dore bullion, flown out to Vancouver.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, GEM, 1971, pp. 65–70; 1973, pp. 459, 460; *B.C. Ministry of Energy, Mines & Pet. Res.*, Geological Fieldwork, 1981, Paper 1982-1, pp. 129, 130; MI 94E-26.

DUTHIE (Fig M-2, NTS 93, No. 32)

Omineca M.D. Lat. 54°46′ Long. 127°21′ (93L/14W)

This old mine is on the southwest slope of Hudson Bay Mountain, 20 kilometres by road west of Smithers.

The property is owned by Silver Standard Mines Ltd., 1199 West Hastings Street, Vancouver V6E 3V4.

Three steeply dipping shear zones occur in tuffs and andesite flow breccias. Locally ore of the zones is brecciated and consists of angular rock fragments cemented and partly replaced by sulphides. Ore minerals include sphalerite, galena, grey copper, and arsenopyrite.

In 1979 and 1980 Paul Kindrat of Smithers did some development work, and shipped nearly 300 tonnes of cobbed ore to the Trail smelter at the close of 1980.
Reference: MI 93L-88.

ENDAKO (Fig. M-2, NTS 93, No. 33)

Omineca M.D. Lat. 54°02′ Long. 125°07′ (93K/3E)

The Endako porphyry molybdenum deposit is at Endako, 190 kilometres west of Prince George, north of the east end of François Lake.

The property of about 350 mineral claims is owned and operated by Endako Mines Division of Placer Development Limited, 1030 West Georgia Street, Vancouver V6E 3A8.

The orebody is in Endako quartz monzonite, a part of the composite Topley intrusions of Jurassic age. The quartz monzonite is intruded by a variety of premineral dykes and by postmineral basalt dykes. The orebody is an irregularly elongated body 3 360 metres long by 370 metres wide. Molybdenite, pyrite, magnetite, and rare chalcopyrite are closely associated with quartz in veins and fracture fillings. Considered as a whole, the entire mineral zone is a stockwork.

Ore minerals occur in major quartz-molybdenite veins 15 centimetres to 1 metre wide, occurring as a series of subparallel and complementary sets, and in fine fracture fillings and veinlets in the form of stockworks. Hydrothermal alteration forms K-feldspar-bearing envelopes and sericite-bearing envelopes bordering veins and fractures. There has been pervasive kaolinization of the Endako quartz monzonite

Mining was by open pit. Concentrator capacity in 1980 was over 30 000 tonnes per day. Some of the molybdenite concentrates were marketed as such, and some were roasted to produce molybdic oxide and a smaller amount of ferromolybdenum. The proportion of the products varied with market conditions.

References: *CIM*, Porphyry Deposits of the Canadian Cordillera, 1976, pp. 444–454; MI 93K-6.

Endako Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	8 543 821	Molybdenite concentrates, 1 488 t; molybdenum trioxide, 7 975 t; ferromolybdenum, 117 t; total content, 5 564 104 kg of molybdenum	—	—	—	—	—	—
1976	8 520 235	Molybdenite concentrates, 1 098 t; molybdic trioxide, 9 771 t; ferromolybdenum, 288 t; total content, 6 786 374 kg of molybdenum	—	—	—	—	—	—
1977	9 084 501	Molybdenite concentrates, 24 t; molybdic trioxide, 12 651 t; ferromolybdenum, 228 t; total content, 7 694 235 kg of molybdenum	—	—	—	—	—	—
1978	10 656 643	Molybdic trioxide, 10 176 t; ferromolybdenum, 200 t; total content, 6 030 967 kg of molybdenum	—	—	—	—	—	—
1979	4 788 000	Molybdenite concentrates, 12 t; molybdic trioxide, 6 205 t; ferromolybdenum, 104 t; total content, 3 738 530 kg of molybdenum	—	—	—	—	—	—
1980	11 103 147	Molybdenum concentrates, 378 t; molybdic trioxide, 7 284 t; ferro-molybdenum, 163 t; total content, 4 651 559 kg of molybdenum	—	—	—	—	—	—

GRANISLE (Fig. M-2, NTS 93, No. 34)

Omineca M.D. Lat. 54°56.5′ Long. 126°09.5′ (93L/16E)

The Granisle porphyry copper deposit is on McDonald Island near the north end of Babine Lake, 16 kilometres north of Topley Landing. The property consists of 142 mineral claims.

It has been owned and operated since 1979 by Noranda Mines, Limited, Babine Division, Box 2000, Granisle V0J 1W0, and formerly by Granisle Copper Limited, a subsidiary of Granby.

The orebody is within a porphyry dyke of Eocene age with an earlier, elliptical plug of quartz diorite phase and a later biotite-feldspar porphyry phase. The later dyke phase is 120 to 200 metres wide, intrusive into Hazelton rocks of predominantly volcanic origin.

Copper mineralization is centred on the contact between early and late intrusive porphyry, and consists of chalcopyrite and bornite in quartz-filled fractures. Alteration shows a central biotitic zone enveloped by a quartz-sericite-carbonate-pyrite zone and an outer chloritic zone.

Mining was by standard open-pit methods. Concentrates were hauled by truck to rail siding at Topley. Concentrator capacity in 1980 was 12 700 tonnes per day. A small molybdenum concentrator was completed in late 1980, but no production was recorded from it.

References: *CIM*, Porphyry Deposits of the Canadian Cordillera, 1976, pp. 239–244; MI 93L-146.

Granisle Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	4 475 103	Copper concentrates, 55 294 t....................	552 140	4 982 701	17 034 399	—	—	—
1976	4 008 222	Copper concentrates, 45 482 t....................	408 227	4 549 902	14 672 658	—	—	—
1977	4 474 119	Copper concentrates, 49 724 t....................	559 761	5 990 904	17 404 635	—	—	—
1978	4 549 265	Copper concentrates, 47 366 t....................	467 571	4 819 410	14 851 373	—	—	—
1979	4 382 882	Copper concentrates, 50 205 t....................	497 624	5 338 725	17 326 860	—	—	—
1980	3 936 725	Copper concentrates, 39 869 t....................	387 083	4 075 675	13 258 799	—	—	—

SAM GOOSLY (Fig M-2, NTS 93, No. 35)

Omineca M.D. Lat. 54°11′ Long. 126°16′ (93L/1W)

This property of some 300 mineral claims is 40 kilometres southeast of Houston, and 6.5 kilometres east of Goosly Lake.

It was developed first by Kennco Explorations, (Western) Limited, and placed in production by Placer Development Limited, 1030 West Georgia Street, Vancouver V6E 3A8. The mining operation was conducted by Equity Silver Mines Limited, of which Placer owns a 70 per cent interest; mine office, Box 1450, Houston V0J 1Z0.

The ore zone is within a west-dipping dacitic volcanic pile of Mesozoic age. The Mesozoic rocks are intruded on the east by a Tertiary syenomonzonite stock. The base of the mine section is quartz pebble conglomerate, above which is a layer or tongue of dacite pyroclastic breccia. The ore occurs within the dacite breccia, in a shattered zone about 53 metres thick. Two principal ore zones are recognized. The Main or north zone is characterized by replacement blebs and masses of a relatively massive aggregate of pyrite, chalcopyrite, pyrrhotite, and tetrahedrite in the host rock. The South Tail zone is characterized by sulphide stringers, veins, and stockworks mineralized sparsely with chalcopyrite and tetrahedrite.

Construction began in April 1979 and a 5 000-tonne-per-day concentrator was in operation in October 1980. Mining was by open pits, one on the Main zone and one on the South Tail zone, the latter zone was to be mined first.

Returns from the first production of 600 000 tonnes were not available at the end of 1980.

References: *B.C. Ministry of Energy, Mines and Pet. Res.*, GEM, 1969, p. 150; 1970, p. 126; MI 93L-1.

SILVER STANDARD (Fig. M-2, NTS 93, No. 36)

Omineca M.D. Lat. 55°19′ Long. 127°37.5′ (93M/5E)

This property of eight Crown-granted mineral claims is on Mount Glen, 9 kilometres north of Hazelton. It is a former important producer.

It is owned by Silver Standard Mines Ltd., 1199 West Hastings Street, Vancouver V6E 3Y4.

Sixteen parallel quartz veins occur in (mainly) tuffaceous sandstone. Mineralization consists of galena, sphalerite, and tetrahedrite, with pyrite and arsenopyrite.

The mine was under lease to George Braun of Hazelton, who from 1975–79 made shipments of sorted ore to the Trail smelter.

Reference: MI 93M-49.

Silver Standard Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	133	Crude ore	218	189 386	—	4 352	4 523	—
1976	152	Crude ore	746	255 791	245	8 842	12 759	—
1977	148	Crude ore	560	236 725	484	11 541	14 681	—
1978	57	Crude ore	187	78 286	138	2 811	4 016	—
1979	93	Crude ore	233	114 243	–	5 348	5 627	—

SUNRISE (Fig M-2, NTS 93, No. 37)

Omineca M.D. Lat. 55°20.5′ Long. 127°27′ (93M/6W)

This group of six Crown-granted and 30 recorded claims is on the north side of Nine Mile Mountain, 16 kilometres northeast of Smithers.

It is owned by Sunrise Metals Corporation, 555 Howe Street, Vancouver. Work was done on the property in 1978–80 by M. Kryger, Box 2018, Smithers V0J 2N0.

Quartz veins occur in east-west fault fissures and in northeast crossfissures, forming a zone about 21 metres wide in altered granodiorite. Galena, jamesonite, sphalerite, and pyrite occur as stringers and blebs in the quartz veins.

A limited amount of surface trenching produced 40 tonnes of shipping ore in 1975 and 26 tonnes in 1978. In 1979 a portable mill was set up and 181 tonnes of ore was treated to produce 15 tonnes of concentrates. A 191-tonne shipment of ore was made in 1980.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, GEM, 1974, pp. 270, 271; MI 93M-43.

Sunrise Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	40	Crude ore	—	45 597	—	4 867	4 908	—
1978	26	Crude ore	—	19 377	—	1 642	2 356	—
1979	181	Silver concentrates, 15 t	—	22 985	—	2 790	2 374	—
1980	191	Crude ore	6 656	31 850	229	3 378	4 030	—

TETRA (Fig M-2, NTS 93, No. 38)

Omineca M.D. Lat. 55°01.9′ Long. 127°14.3′ (94M/3E)

This group of recorded mineral claims is in the canyon of Causqua Creek, 20 kilometres north of Smithers.

The property was owned by Virginia Silver Mines Ltd. in 1975–77. In 1980 the owner was listed as Armagh Mines Ltd., 205 Fifth Avenue SW., Calgary T2P 2V7.

A vein shear dipping about 15 degrees eastward is in folded volcanic sandstones of the Bowser Group. The vein varies from a series of thin veinlets that horsetail into the bedding to a body a metre or more wide. It consists of partially replaced wallrock with variable amounts of quartz, ankerite, and sulphides; the latter include sphalerite, galena, pyrite, tetrahedrite, arsenopyrite, and traces of bournonite, polybasite, and pyrargyrite.

In 1975 and 1976, Paul Kindrat of Smithers, under a leasing agreement, shipped a total of 249 tonnes of sorted ore to the Trail smelter. A small concentrator with a capacity of 70 tonnes per day was partly built in 1977 and was completed in 1980 but was not in production.

References: *Minister of Mines, B.C.*, Ann. Rept., 1968, pp. 124–126; MI 93M-21.

Tetra Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	60	Crude ore	84	212 185	—	2 612	—	—
1976	189	Crude ore	317	485 767	—	7 145	6 240	—

BRENDA (Fig M-2, NTS 92, No.39)

Osoyoos M.D. Lat. 49°53′ Long. 120°00.5′ (92H/16E)

The Brenda porphyry copper-molybdenum deposit is 22.5 kilometres west of Okanagan Lake at Peachland.

Extensive claim holdings are owned by Brenda Mines Ltd., Box 420, Peachland.

The orebody is within the Brenda Stock, a composite quartz diorite to granodiorite body of Jurassic age, which intrudes rocks of the Upper Triassic Nicola Group. It is cut by pre-ore and post-ore dykes of divergent compositions.

Mineralization is confined almost entirely to veins, most of which are quartz veins. Chalcopyrite and molybdenite are the principal sulphides, accompanied by minor and variable amounts of pyrite and magnetite and rarely other minerals. Grade is a function of density of fracturing and mineralogy of the veins. Alteration is generally confined to narrow envelopes bordering veins.

Conventional open-pit mining supplied the concentrator with about 27 000 tonnes of ore per day. The concentrator produced copper concentrate and molybdenite concentrate. A hot chloride leaching process reduced the levels of lead and copper impurities in the molybdenite concentrate. In 1975–77 molybdic oxide was also produced. Copper concentrates were trucked to rail terminus at Kelowna; molybdenite concentrates were trucked to Vancouver.

Reclamation and pollution control were a continuing concern of the company. Fresh water was collected during spring runoff and stored in a dam confining 1 233 hectare metres of fresh water. Mill water and pit-drainage water were reclaimed and recirculated.

Total diversion of MacDonald Creek was effected, and the headwaters of Peachland Creek were directed round the pit area. This was to ensure water acceptable to downstream users. Continuing studies were made of methods for providing ground cover on waste piles and disturbed ground.

Ore reserves at December 31, 1980 were 130 000 000 tonnes grading 0.146 per cent copper and 0.032 per cent molybdenum.

References: *CIM*, Porphyry Deposits of the Canadian Cordillera, 1976, pp. 186–194; MI 92H/NE-47.

Brenda Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	9 115 839	Copper concentrates, 52 314 t; molybdenite concentrates 6 511 t; molybdic oxide, 725 t; total content, 4 074 073 kg of molybdenum	125 718	7 872 511	15 101 190	—	—	—
1976	10 047 565	Copper concentrates, 51 854 t; molybdenite concentrates 6 514 t; molybdic oxide, 132 t; total content, 3 705 953 kg of molybdenum	123 697	7 891 360	14 652 834	—	—	—
1977	9 634 421	Copper concentrates, 54 837 t; molybdenite concentrates 6 792 t; molybdic oxide, 15 t; total content, 3 866 503 kg of molybdenum	102 080	8 017 576	16 133 570	—	—	—
1978	9 995 736	Copper concentrates, 46 880 t; molybdenite concentrates 5 820 t; containing 3 310 663 kg of molybdenum	111 629	7 140 191	45 072 630	—	—	—
1979	9 075 723	Copper concentrates, 36 672 t; molybdenite concentrates 4 496 t; containing 2 536 180 kg of molybdenum	101 289	5 727 844	10 626 562	—	—	—
1980	9 126 860	Copper concentrates, 32 390 t; molybdenite concentrates 3 330 t; containing 1 855 166 kg of molybdenum	77 494	4 816 579	9 152 418	—	—	—

DUSTY MAC (Fig. M-2, NTS 82, No. 40)

Osoyoos M.D. Lat. 49°21′ Long. 119°33′ (82E/5E)

This property is 1.6 kilometres east of the village of Okanagan Falls at the south end of Skaha Lake.

It is owned by Dusty Mac Mines Ltd., 355 Burrard Street, Vancouver V6C 2G8.

A gently dipping lens of quartz-filled breccia occurs in Eocene andesitic volcanic rocks. The breccia possibly formed in dilation zones in faults on which there was some later movement. Minor amounts of pyrite, chalcopyrite, metallic silver, and metallic gold are present.

Open-pit mining of the quartz breccia began in July 1975 and finished in February 1976, when the known reserves were exhausted. The orebody was essentially at surface, and the stripping ratio was about 1:1. Ore was custom milled at the Horn Silver Mine of Dankoe Mines Ltd., south of Keremeos.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, Bull. 61, Geology of the White Lake Basin, 1973, pp. 89–92; MI 82E/SW-78.

Dusty Mac Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	39 940	Gold-Silver concentrates	239 431	4 293 240	740	1 066	—	—
1976	53 335	Gold-silver concentrates, 626 t........................	364 336	6 210 336	1 692	1 053	—	—

HORN SILVER (Fig. M-2, NTS 82, No. 41)

Osoyoos M.D. Lat. 49°03.4′ Long. 119°41′ (82E/4E)

This property is on the western slope of Mount Richter, 20 kilometres south of Keremeos.

It is owned by Dankoe Mines Ltd., 1177 West Hastings Street, Vancouver V6E 2L6.

The ore zone is in a monzonite phase of the Kruger syenite. A shear zone about 24 metres wide dips 40 degrees to the south. Quartz lenses within the shear plunge at a low angle to the southwest. Mineralization includes galena, sphalerite, and chalcopyrite, and silver-bearing minerals.

The present company acquired the property in 1973 and did considerable development work. From July 1975 to July 1976, the concentrator treated ore from the Dusty Mac property at Okanagan Falls. Since the latter date production was steady at a production rate of 150 tonnes per day. Bulk flotation and jig concentrates were trucked to the Trail smelter.

References: *Minister of Mines, B.C.*, Ann. Rept., 1965, pp. 162, 163; MI 82E/SW-2.

Horn Silver Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	17 916	Silver concentrates, 792 t	11 010	8 120 682	5 013	18 058	25 102	—
1976	20 936	Silver concentrates, 661 t	20 292	6 988 937	4 127	17 657	22 143	—
1977	31 984	Bulk and jig concentrates, 1 168 t	24 260	8 917 790	4 170	23 759	27 993	—
1978	28 677	Bulk concentrates, 979 t; jig concentrates, 97 t	23 949	7 569 195	5 518	21 091	27 927	—
1979	25 536	Bulk concentrates, 872 t; jig concentrates, 132 t	18 755	6 084 338	4 789	17 244	24 299	—
1980	19 634	Bulk concentra , 678 t	7 981	2 936 329	—	9 275	15 273	—

SUSIE (Fig. M-2, NTS 82, No. 42)

Osoyoos M.D. Lat. 49°13′ Long. 119°36′ (82E/4E)

This old property is 5 kilometres northwest of Oliver. Sparsely mineralized quartz veins in granite contain gold values and command a preferential smelter rate owing to the silica content.

In 1975–76, Harold Hemmerick, of Oliver, trucked 10 404 tonnes of ore to Trail.

Reference: MI 82E/SW-90.

Susie Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	7 365	Crude ore	43 762	779 752	3 080	25 434	11 974	—
1976	3 039	Crude ore	12 535	233 273	943	10 995	4 295	—

INGERBELLE, COPPER MOUNTAIN (Fig. M-2, NTS 92, No. 43)

Similkameen M.D. Lat. 49°20′ Long. 120°33′ (92H/7E)

This extensive property is 15 kilometres south of Princeton. The Copper Mountain mine is on the east side of the Similkameen River and the Ingerbelle mine is on the west side, adjacent to the highway.

The property is owned by Newmont Mines, Limited, Similkameen Division, 750 West Pender Street, Vancouver V6C 1K3; mine office, Box 520, Princeton V0X 1W0. The

Copper Mountain mine was formerly owned by Granby Mining Corporation, which company produced 31.5 million tonnes of ore from underground and glory holes and 1.9 million tonnes from open pits before closure in 1957. The Ingerbelle was brought into production by the present company in 1972.

All of the known copper deposits lie in a 1 100-metre by 4 300-metre belt of Nicola volcanic rocks, bounded on the south by the composite Copper Mountain stock and on the north by the Lost Horse intrusive complex. It is believed that the Copper Mountain intrusions, the mineralization associated with them, and the volcanic rocks, are all of Late Triassic age. Fluids producing alteration and mineralization came from the Lost Horse complex of porphyries and porphyry breccias.

Alteration is intense, involving early biotite, later pink feldspar, and chiefly at and near the Ingerbelle, scapolite. Mineralization, of chalcopyrite and bornite, is in fracture fillings and disseminations. Bornite is more common at Copper Mountain, where pegmatite veins occur up to 2.3 metres thick, containing potash feldspar, biotite and, in places striking masses of bornite. Bornite is rare at Ingerbelle, and intensity of fracturing, which is erratic, controls the grade of ore.

The Copper Mountain mine has been referred to as a porphyry copper deposit, and the Ingerbelle as a skarn deposit.

Mining was by open pit. The concentrator, with a capacity of 17 000 tonnes per day, is on the west, Ingerbelle side, of the river. Tailings were piped across the river to an impoundment area in a narrow dry valley. The Ingerbelle orebodies were limited, and, as mining progressed, preparations proceeded for production from Copper Mountain pits. Ingerbelle mine produced from August 1972 to 1981. Copper Mountain began producing in late 1980, and crushed ore was transported by conveyor on a bridge across the river.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, Bull. 59, Geology of Copper Mountain, British Columbia, 1972; *CIM*, Porphyry Deposits of the Canadian Cordillera, 1976, pp. 368–375; MI 92H/SE-1–11, 40.

Ingerbelle Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	3 683 900	Copper concentrates, 46 865 t	574 783	2 551 006	12 768 721	—	—	—
1976	6 355 874	Copper concentrates, 91 211 t	1 198 523	4 814 153	25 045 931	—	—	—
1977	7 135 737	Copper concentrates, 74 838 t	969 169	3 980 500	20 596 981	—	—	—
1978	6 779 045	Copper concentrates, 88 964 t	1 152 926	4 347 297	24 725 222	—	—	—
1979	6 898 844	Copper concentrates, 94 297 t	1 185 509	4 316 292	26 506 197	—	—	—
1980	6 612 035	Copper concentrates, 90 871 t	1 168 495	4 860 882	26 258 573	—	—	—

GOAT (Fig. M-2, NTS 104, No. 44)

Skeena M.D. Lat 56°10.5′ Long. 129°33.6′ (104A/4E)

This property is on Goat Ridge at the headwaters of Surprise Creek, 14 kilometres from the Stewart-Cassiar Highway, at a point 65 kilometres by road from Stewart.

It is controlled by Nor-Quest Resources Ltd., 102 Piper Crescent, Nanaimo V9S 3G3.

Three siderite and quartz veins cut andesitic agglomerates and intercalated siltstones of the Hazelton Group. Mineralization includes galena, sphalerite, tetrahedrite, pyrite, chalcopyrite, and minor arsenopyrite. Prior to 1975, development work had been done on four levels by earlier owners; in 1975 a small shipment of ore was made by Nordore Mining Co. Ltd., and ore was stockpiled in later years.

In 1979 a shipment of ore was made by the present company; in 1980 some ore was shipped, and some was milled in a 50-tonne concentrator beside the highway at Strohn Creek.

Reference: MI 104A-3.

Goat Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	16	Crude ore	—	15 925	—	67	352	—
1979	124	Crude ore	1 110	540 401	—	726	9 789	—
1980	1 865	Silver concentrates 30 t; crude or 1 462 t......	3 412	945 075	153	3 278	32 397	—

GRANDUC (Fig. M-2, NTS 104, No. 45)

Skeena M.D. Lat. 56°13′ Long. 130°21′ (104B/1W)

The mine is on the northern edge of Leduc Glacier, draining to the west, and the concentrator is at the foot of Berendon Glacier, draining eastward to the Bowser River. The concentrator is 51 kilometres north of Stewart by road, and access thence to the mine is by a tunnel 16.5 kilometres long, driven beneath a summit of the Coast Range.

The property was owned by Granduc Mines, Limited and was leased in 1965 jointly by Newmont and Asarco, and operations were conducted by Granduc Operating Company until 1977, when work continued under Granduc Operating Division of Newmont Mines Limited. First production of concentrates was in November 1970. Operations were suspended in mid-1978, and in May 1979 control of the property was gained by Esso Minerals Canada. Production resumed in October 1980 by Canada Wide Mines Limited, a wholly owned subsidiary of Esso; mine office, Box 190, Stewart V0T 1W0.

The orebodies are in a 60-metre-thick sedimentary unit dipping steeply west between a limestone member above and andesite below. The rocks of the ore zone are mostly fine grained and thin bedded, and are crossfolded, crumpled, and sheared with production of compositionally banded, quartz-rich biotite and sericite rocks. The several orebodies are "stringer lodes" containing disseminations, specks, streaks, and masses of chalcopyrite, pyrrhotite, magnetite, and minor pyrite. The entire ore horizon has been referred to as a shear zone with a complex history of dragfolding and of intrusion by andesitic porphyry dykes.

The mine was developed first by a 3250 haulage adit from surface above Leduc Glacier, and by an internal shaft to the 2600 (792-metre elevation) level, which became the main haulage level to the concentrator, 16.5 kilometres from the shaft. Above the 2600 level all workings were trackless, forming a series of ramps and sublevels. In later years a sublevel method of mining was employed.

Following the mine closure in 1978, winter snow load caused a major collapse of roof and floors of the concentrator. Restoration work on surface was completed in December 1979, and restoration work underground proceeded. Milling was resumed at a reduced rate in November 1980, and about 80 000 tonnes of ore was milled. There is no record of 1980 metal production.

Reference: MI 104B-21.

Granduc Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	1 499 585	Copper concentrates, 56 813 t........................	162 606	9 604 482	16 222 977	—	—	—
1976	1 315 905	Copper concentrates, 54 894 t........................	154 800	10 373 566	15 589 210	—	—	—
1977	1 252 382	Copper concentrates, 48 575 t........................	130 011	8 631 953	13 262 755	—	—	—
1978	741 648	Copper concentrates, 52 268 t........................	160 460	9 056 914	14 780 100	—	—	—

PREMIER (Fig. M-2, NTS 104, No. 46)

Skeena M.D. Lat 56°03.5′ Long. 130°00.1′ (104B/1E)

The old Premier mine, on an extensive property, is 19 kilometres north of Stewart.

It is owned by British Silbak Premier Mines Ltd., 1055 West Hastings Street, Vancouver V6E 2E6.

The Premier orebodies are in schistose, intercalated volcanic agglomerates, tuffs, and porphyries cut by several varieties of dyke rocks. Ore is in lenses of silicified and pyritized country rock, and is localized along northwest and northeast fracture zones, particularly at contacts between fragmental volcanics and feldspar porphyries. Ore minerals include sphalerite, galena, chalcopyrite, silver-bearing sulphides, and electrum. Some of the early-mined ore was of bonanza grade.

In 1976–79, Spring Investments Limited, Box 340, Stewart, investigated the potential of the property, chiefly by geological mapping and diamond drilling. Small shipments were made of ore and mill clean-up

References: *Minister of Mines, B.C.*, Ann. Rept., 1964, pp. 21, 22; MI 104B-54.

Premier Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1976	73	Crude ore	2 115	62 984	—	1 903	2 541	—
1977	42	Clean-up	1 490	38 091	262	7 629	6 091	—
1978	245	Clean-up; lead concentrates, 58 t; ore, 187 t	9 144	312 212	98	17 915	15 035	—
1979	105	Clean-up; lead concentrates, 36 t; ore, 69 t	2 242	13 122	445	9 937	8 146	—

TASU (Fig. M-2, NTS 103, No. 47)

Skeena M.D. Lat. 52°45.5′ Long. 132°03′ (103C/16E)

This property of more than 100 mineral claims is on the south side of Tasu Sound, Moresby Island. It is reached by float plane from Sandspit.

It is owned by Wesfrob Mines Limited, 1113 West Pender Street, Vancouver, a division of Falconbridge Nickel Mines Limited.

The ore zone is in a folded and tilted panel of stratified rocks surrounded and underlain in part by the north end of San Christoval batholith. The stratified rocks are the upper part of the volcanic Karmutsen Formation and the overlying Kunga Formation. A laccolith of diorite porphyry lies chiefly between the two formations. The batholith has produced skarnification of all these rocks. Magnetite and chalcopyrite ore, and associated skarn, occur for the most part in Kunga limestones and diorite porphyry, and in limited amounts in Karmutsen volcanic rocks. Most of the ore is in a stratiform zone about 63 metres thick, replacing massive Kunga limestone and diorite porphyry. Many post-ore dykes cut the ore zone.

Production began in 1967. Mining was by open pit until mid-1977, since which time it has been by underground longhole drilling and trackless haulage. The concentrator was designed to treat magnetite ore to produce a concentrate of sinter feed; and to treat magnetite-chalcopyrite ore to produce a finely ground magnetic concentrate as pellet feed, and a copper concentrate after removal of the magnetite.

References: *Minister of Mines, B.C.*, Ann. Rept., 1974, pp. 320, 321; *B.C. Ministry of Energy, Mines & Pet. Res.*, Bull. 54, pp. 83–89; MI 103B-C-5, 7, 56.

Tasu Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	1 622 385	Iron concentrates, 946 719 t; copper concentrates, 7 934 t	42 238	1 720 991	1 499 933	—	—	—
1976	1 572 524	Iron concentrates, 837 813 t; copper concentrates, 11 641 t	59 002	2 406 781	2 265 207	—	—	—
1977	1 020 886	Iron concentrates, 384 309 t; copper concentrates, 11 660 t	1 817	80 671	5 080 107	—	—	—
1978	889 933	Iron concentrates, 554 414 t; copper concentrates, 5 989 t	28 397	1 198 647	1 175 609	—	—	—
1979	1 009 247	Iron concentrates, 589 642 t; copper concentrates, 18 739 t	92 158	3 529 716	3 861 563	—	—	—
1980	996 422	Iron concentrates, 581 637 t; copper concentrates, 10 689 t	51 694	2 206 506	2 225 590	—	—	—

Slocan M.D. (82F)

SLOCAN SHIPPING MINES

In addition to the properties described in these pages there were, in the six years 1975 to 1980, 50 others from which production was recorded but other details were lacking. All these properties are in the Slocan Mining Division, and all but three or four in what has been recognized for years as the "Slocan Mining Camp", tributary to Sandon, New Denver, Silverton, Slocan village, and Kaslo. They are listed in the following table, with appropriate years of production.

Most shipments were small, and were made to the Trail smelter, but a little ore was treated by custom concentrators: Ottawa near Slocan village, Silvana (formerly Carnegie or Silmonac) at Sandon, and David (formerly Yale) at Ainsworth. Custom ore was in some instances bought on the basis of mill-feed assay. The production figures may be found in Table M-1 in the back of the present volume.

These properties are mentioned because they provide a measure of activity in the camp, whether by individuals, small groups, or company endeavour. It should be understood that most of the shipments made were of sorted ore, and in no sense represent mining grade of vein matter. Some represent recovery from dumps, and many were of known remnants of ore that were shipped to take advantage of advanced metal prices. In some instances, there is no knowledge of which vein was involved, or which specific mineral claim. Clean-up activity (salvage) at the Bluebell and other concentrators does not merit inclusion in the following list.

SLOCAN SHIPPING MINES

ANTOINE, 1975
ARKANSAS, 1976
AU, 1979
BLUEBIRD, 1978, 1979, 1980
BOSUN, 1976
CAPELLO, 1980
CHIEF, 1976, 1977
COLONIAL, CHICAGO, 1978, 1979
CORINTH, 1978
EASTMONT, 1975
EMERALD HILL, 1979
ENTERPRISE, 1975, 1976, 1977
FISHER MAIDEN, 1979
FOURTH OF JULY, 1979
GALENA FARM, 1975, 1977
GLADSTONE, 1976, 1979
HALL, 1980
HECLA, 1975, 1980
HERCULES, 1977
JESSE, 1975, 1976
KALISPEL, 1975
LAKEVIEW, 1979, 1980
LEO, 1976
LITTLE TIM, 1975, 1978
LUCKY BOY, 1976
LUCKY SPOT, 1976
LUCKY THOUGHT, 1977
McALLISTER, 1980
MAMMOTH, 1978
MEMPHIS, 1979
MERCURY, 1980
METEOR, 1980

SLOCAN SHIPPING MINES—*Continued*

MILLIE MACK, 1979
MOLLY HUGHES, 1979
MONARCH, 1980
MOOSE, 1976, 1977
MORNING STAR, 1975, 1979
NOONDAY, 1980
PUCK, 1980
QUEEN BESS, 1978
RITCH-MITCH, 1980
SHANNON, 1975
SILVER MAIDEN, 1979
SNOWSTORM, 1980
SPOKANE, 1979
VICTOR, 1975, 1976, 1977, 1979
WASHINGTON, 1975
WESTMONT, 1980
WHITEWATER, 1975, 1976, 1977, 1980
WONDERFUL, 1979

ARLINGTON (Fig. M-2, NTS 82, No. 48)

Slocan M.D. Lat. 49°47.4′ Long. 117°21.6′ (82F/14W)

This property of 18 Crown-granted and recorded mineral claims is on Springer Creek, 11 kilometres east of Slocan Village.

It is owned by Arlington Silver Mines Ltd., Slocan, and was leased by Slocan interests who mined in 1975 and 1979–80.

The ore is in breccia veins in Nelson granite, within a lode which is as wide as 20 metres. Mineralization is of dry ore type, with much quartz. In 1978 the lower adit or A level was rehabilitated for 90 per cent of its length. Shipments to the Ottawa concentrator were 152 tonnes in 1978 and 1 037 tonnes in 1979.

Reference: MI 82F/NW-152

Arlington Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	120	Crude ore	—	44 384	—	6 679	8 317	—
1976	21	Lead concentrates salvaged from dump	62	170 258	—	6 680	4 185	—
1978	152	Lead concentrates, 17 t; dump clean-up	—	84 569	—	5 946	3 647	—
1979	1 037	Lead concentrates, 32 t; zinc concentrates, 17 t	588	117 300	53	15 724	12 967	46

HEWITT (Fig. M-2, NTS 82, No. 49)

Slocan M.D. Lat. 49°56′ Long. 117°18′ (82F/14W)

This old property of 26 Crown-granted mineral claims and fractions is on the south side of Silverton Creek, 4.8 kilometres east-southeast of Silverton. It is owned by Dungannon Explorations Ltd. and Sabina Industries Ltd., both of Toronto.

Mineralized pods and lenses occur in a broad shear zone crossing Slocan sedimentary rocks.

In 1976–80 Frank Pho of New Denver performed a variety of work, including shaft sinking 35 metres from No. 1300 level (No. 10 East adit) to No. 1400 level, and drifting and raising on No. 1400. Sublevel drifting was done, and a winze was sunk from No. 1390 level to No. 1460, a distance of 22 metres. Stoping was done in 1978 and 1979, and stopes were drawn in 1980. Shipments were made to the concentrator at Sandon, owned, since June 1977, by Silvana Division of Dickenson Mines Limited, 855 tonnes.

Ore was sold to Silvana, as follows:

1977, 400 tonnes assaying:	silver, 248.8 grams per tonne; lead, 2 per cent; zinc, 5 per cent
1978, 2 800 tonnes assaying:	silver, 297.6 grams per tonne; lead, 2.6 per cent; zinc, 6.6 per cent

1980, 2 000 tonnes assaying: silver, 559.8 grams per tonne; lead, 2.9 per cent; zinc, 7.2 per cent

Reference: MI 82F/NW-65

Hewitt Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1976	855	Lead concentrates, 41 t; zinc concentrates, 89 t	—	325 493	—	24 039	47 632	332

LAST CHANCE (Fig. M-2, NTS 82, No. 50)

Slocan M.D. Lat. 49°59.8′ Long. 117°12′ (82F/14E)

This property of nine Crown-granted mineral claims is on Keen Creek, a tributary of Kaslo River.

Mineralization is in a shear zone near an irregular contact between feldspar porphyry and Slocan sedimentary rocks.

Owned by Keen Creek Developments Ltd. of Kaslo, it was leased to David Minerals Ltd. In 1979 the latter company did 61 metres of trackless drifting and mined a small stope. Production of 997 tonnes of ore was shipped to the latter company's concentrator at Ainsworth. Gross content in concentrate: gold, 717 grams; silver, 51.862 grams; lead, 9 492 kilograms; zinc, 103 331 kilograms; copper, 238 kilograms; and cadmium, 976 kilograms.

Reference: MI 82F/NW-20.

LUCKY THOUGHT (Fig. M-2, NTS 82, No. 51)

Slocan M.D. Lat. 49°56.3′ Long. 117°18′ (82F/14W)

This property is on the south side of Silverton Creek, 9 kilometres by road east of Silverton. It consists of the NB mineral claim, a relocation by Sydney Berisoff of the Lucky Thought claim, which had lapsed.

Mineralization is in a quartz-carbonate vein within slaty Slocan sedimentary rocks, in a shear zone which is subparallel to the Hewitt-Van Roi lode.

In the four years, 1976–79, Mr. Berisoff and two others sank a small shaft on the vein to a depth of 15.2 metres, and an 18 per cent decline another 10 metres, above which some stoping was done. Some ore from this work was shipped to Trail, some to the Ottawa concentrator, and some to the Silvana concentrator at Sandon.

Reference: MI 82F/NW-63.

Lucky Thought Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1977	327	Crude ore	—	329 630	144	25 407	28 819	191

OTTAWA (Fig. M-2, NTS 82, No. 52)

Slocan M.D. Lat. 49°47.5′ Long. 117°24′ (82F/14W)

This property, of 16 Crown-granted mineral claims, is on Springer Creek, 9 kilometres east of Slocan village. The mine was an old producer.

It is owned by Slocan Development Corporation Limited, 1177 West Hastings Street, Vancouver V6E 2L6. An old concentrator of limited capacity is owned by Selman Resources Ltd. of Kamloops.

Quartz veins in a broad sheared and brecciated zone in coarse porphyritic Nelson granite contain galena and sphalerite as well as metallic silver, argentite, and tetrahedrite.

In 1976-77-78, the mine was leased to C. Thickett of Slocan village and shipments were made to the concentrator. In 1979-80 the mine was leased to Memphis Mines Ltd. through Mr. Thickett. Sixty-nine tonnes of ore was shipped to Trail in 1979 and 596 tonnes in 1980.

Reference: MI 82F/NW-155

Ottawa Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	12	Crude ore	—	105 532	—	82	35	—
1976	1 348	Silver concentrates, 13 t; crude ore, 11 t	18	999 402	226	1 623	1 169	—
1977	1 304	Silver concentrates, 8 t; crude ore, 112 t	33	1 325 579	196	557	344	—
1978	496	Silver concentrates, 7 t; crude ore, 42 t	—	1 372 047	234	647	335	—
1979	69	Crude ore	—	673 764	—	—	—	—
1980	596	Crude ore	—	994 680	—	—	—	—

PANAMA, SILVER GLANCE (Fig. M-2, NTS 82, No. 53)

Slocan M.D. Lat. 50°03.6′ Long. 117°12.5′ (82K/3E)

This property is on the slope of London Ridge at 2 040 metres elevation, 6.4 kilometres by steep road from Fish Lake on the Kaslo-New Denver road.

It is owned by United Hearne Resources Ltd., 1199 West Hastings Street, Vancouver V6E 2K5.

A narrow quartz vein in Slocan sedimentary rocks was investigated by the company, making shipments of ore in 1975, 1976 and 1979. The mine was leased in 1980 by W. F. Petrie of Merritt.

Reference: MI 82K/SW-28, 55.

Panama, Silver Glance Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	379	Crude ore	—	360 546	—	1 438	1 187	—
1976	184	Crude ore	63	182 451	—	919	736	—
1979	850	Crude ore	342	757 121	—	4 196	—	—
1980	826	Crude ore	409	904 800	809	2 889	621	—

SCRANTON (Fig. M-2, NTS 82, No. 54)

Slocan M.D.	Lat. 49°47.3′	Long. 117°03.6′	(82F/14E)

This property of eight Crown-granted claims is on Pontiac Creek, a southern tributary of Woodbury Creek, 13 kilometres from Woodbury Creek mouth on Kootenay Lake.

Owned in 1975 by Silver Star Mines Ltd., it was bought in mid-1977 by David Minerals Ltd., 475 Howe Street, Vancouver V6C 2B3.

Quartz and quartz-carbonate veins occur within granodiorite of the Nelson batholith, in a fault structure dipping steeply to the southeast. The zone has been traced on the surface for more than 2 kilometres. Seven sections of vein had work done on them previously, with an average width of about 0.75 metre. Mineralization is disseminated or massive galena, sphalerite, and pyrite.

Ore was produced in 1975 to 1979, part of the time under contract by Hem Mines Ltd., and was hauled to the David Minerals' concentrator, formerly owned by Yale Lead & Zinc Company, 2 kilometres south of Ainsworth. Production stopped in February 1980, and a more intensive development of the mine was started.

Reference: MI 82F/NW-112.

Scranton Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	1 611	Lead concentrates, 99 t; zinc concentrates, 114 t	4 821	214 828	—	76 844	64 622	1 338
1976	4 787	Lead concentrates, 295 t; zinc concentrates, 348 t; crude ore, 73 t	25 162	573 944	77	223 705	196 361	4 041
1977	6 869	Lead concentrates, 259 t; zinc concentrates, 287 t	29 019	468 660	35	182 843	171 209	3 740
1978	114	Lead concentrates, 56 t; zinc concentrates, 58 t	5 381	109 669	—	41 112	32 651	681
1979	3 120	Lead concentrates, 53 t; zinc concentrates, 259 t	3 348	117 670	1 012	37 258	131 535	1 563

SILMONAC (Fig. M-2, NTS 82, No. 55)

Slocan M.D.	Lat. 49°58′	Long. 117°15′	(82F/14W)

The concentrator is 1 kilometre below Sandon. The property of 62 Crown-granted mineral claims and fractions extends up the hillside along Tributary Creek, to the ridge summit.

The mine was purchased in 1977 by Dickenson Mines Limited of Toronto, and has since been operated by its Silvana Division: Silvana Mines Inc., New Denver. What is essentially the same property was once owned and operated by Carnegie Mining Corporation Limited, largely to explore the region of the Ruth Hope and Silversmith vein systems. A 150-tonne concentrator was built, and had operated, since 1958, on a custom basis until purchased by Silvana. Violamac Mines Limited acquired the property, and in 1966 merged to form Kam Kotia Mines Ltd., which company mined on a joint venture basis with Burkam Mines Ltd. until 1974, and then under its own direction. In June 1977, the present company acquired the property and the concentrator. The former operation gave the name Silmonac to the mine, and, as some of the workings of which lie beneath the Minniehaha mineral claim, that name has been applied also.

The ore is in a complex, rather flatly dipping vein system in Slocan sedimentary rocks locally intruded by quartz diorite sills and dykes.

The mine was first developed from a crosscut driven from the old Ruth No. 5 level, by the 4000 level, and by the 4625 level. In 1975 and later, trackless mining was employed.

Mining was complicated by low dips of the ore shoots and weak ground. The concentrator operated at about 16 000 tonnes per year and in 1980 treated 29 820 tonnes of ore.

Reference: MI 82F/NW-50.

. *Silmonac Production*

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	10 928	Lead concentrates, 982 t; zinc concentrates, 757 t	—	6 228 905	—	591 385	471 192	2 940
1976	16 694	Lead concentrates, 1 412 t; zinc concentrates, 1 240 t	—	7 408 703	—	836 172	743 490	4 643
1977	15 996	Lead concentrates, 1 873 t; zinc concentrates, 1 014 t	—	9 163 815	—	1 102 548	712 759	3 995
1978	15 987	Lead concentrates, 1 460 t; zinc concentrates, 972 t	—	7 579 024	—	883 758	638 881	3 724
1979	19 625	Lead concentrates, 1 500 t; zinc concentrates, 1 323 t	—	9 021 470	—	912 566	813 375	4 961
1980	29 820	Lead concentrates, 1 362 t; zinc concentrates, 1 223 t	—	7 687 934	—	791 327	726 989	4 410

UTICA (Fig. M-2, NTS 82, No. 56)

Slocan M.D. Lat. 49°58.5′ Long. 117°07.7′ (82F/14E)

This old property of 17 Crown-granted mineral claims is on Keen Creek, a branch of Kaslo River, 31 kilometres by road from Kaslo.

Formerly owned by Utica Resources Ltd., it was purchased in August 1980 by David Minerals Ltd., 475 Howe Street, Vancouver V6C 2B3.

Veins of calcite, siderite, and quartz in Slocan sediments are mineralized with galena and sphalerite. Silver values are associated with sphalerite as well as galena.

In 1980, ore, chiefly from mine dumps, was hauled to the David Minerals' concentrator at Ainsworth.

Reference: MI 82F/NW-86.

Utica Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1980	9 525	Lead concentrates 403 t; zinc concentrates 150 t; crude ore 12 t..................................	804	1 056 989	—	28 755	141 958	577

BLUE BIRD (Fig. M-2, NTS 82, No. 57)

Trail Creek M.D. Lat. 49°04′ Long. 117°48′ (82F/4W)

A large group of claims on Trail Creek, 2 kilometres by road south of Rossland is owned by Ross Island Mining Co. Ltd., 1030 West Georgia Street, Vancouver V6E 3C2. Within that group the Bluebird, Copper Queen, and Mayflower Crown-granted mineral claims were leased by Standonray Mines Ltd., 2086 St. Paul Street, Rossland.

An easterly striking quartz vein in volcanic rocks of the Mount Roberts Formation is mineralized with sphalerite, galena, pyrite, and arsenopyrite.

In 1975 open stoping was done in higher grade sections of the mine, and low-grade sections were left as pillars; some of the ore was treated in a small concentrator at the main portal. In 1976, 474 tonnes of ore was shipped to the smelter. In 1977, about 2 000 tonnes was shipped, but the concentrator was not used.

Reference: MI 82F/SW-145, 146.

Bluebird Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1975	1 358	Crude ore; silver concentrates, 91 t	2 809	1 173 005	—	46 333	51 846	—
1976	474	Crude ore	696	307 772	—	13 205	15 378	—
1977	2 081	Crude ore	1 454	586 758	—	29 709	35 135	—
1978	130	Lead concentrates, 54 t; zinc concentrates, 76 t	560	280 860	—	13 755	29 385	—

BLUE JACK and CALLAGHAN (Fig. M-2, NTS 92, No. 58)

Vancouver M.D. Lat. 50°04′ Long. 123°08′ (92J/3E)

The property of 194 mineral claims (in 1977) is north of Brandywine Falls, 40 kilometres north of Squamish.

It was owned by Van Silver Mines Ltd., 409 Granville Mall, Vancouver V6C 1T5, which company went into receivership December 29, 1977.

Veins and quartz-carbonate stringers are mineralized with galena, sphalerite, chalcopyrite, and pyrite; metallic gold and tetrahedrite are present in some places. Country rocks are metamorphosed volcanic and sedimentary rocks, intruded by Coast granodiorite and quartz diorite.

In 1976 work on the Silver Tunnel zone on the Sunny Cave claim included driving five crosscuts. A concentrator building was erected and some equipment was installed. In 1977, the 100-tonne-per-day concentrator was completed, and ore from the Silver Tunnel, Main Showing pit, and Tedi open pit totalling 8 067 tonnes was milled.

Reference: MI 92J/W-1, 3

Blue Jack Production

Year	Ore Produced *tonnes*	Products Shipped	Gross Metal Content					
			Gold *g*	Silver *g*	Copper *kg*	Lead *kg*	Zinc *kg*	Cadmium *kg*
1977	8 067	Silver concentrates	1 381	157 468	1 290	6 764	9 857	—

BRITANNIA (Fig. M-2, NTS 92, No. 59)

Vancouver M.D. Lat. 49°36′ Long. 123°08′ (92G/11E)

The Britannia mine is on the east side of Howe Sound at Britannia Beach, 65 kilometres north of Vancouver. It was owned by Anaconda Britannia Mines, a division of Anaconda Canada Limited, until the mine, and part of the extensive property, was sold on October 29, 1979, to Copper Beach Estates Ltd. Anaconda Canada retained 299 Crown-granted mineral claims covering 5 582 hectares.

The Britannia ore zone lies within an extensive shear zone in a roof pendant in Coast Intrusion rocks. Orebodies are localized in mainly volcanic rocks, in response to variations in structure within the main Britannia shear.

The Britannia is one of the oldest copper mines in the area. A concentrator was put into operation in 1905 and closure came on November 1, 1974. The mine was developed through a vertical range of 1 900 metres (from the outcrop of ore to a shaft sump at the

6 300 level). Several separate sections or mines were developed, but all were parts of a single operation and delivered ore to the concentrator through the same main haulage level.

In 1975, dismantling and removal of underground equipment was completed. Sale of mine, mill, and shop equipment and supply inventory was by public auction on August 13 and 14, 1975, and removal of material by the purchasers was substantially complete by the end of the year.

Following closure of the mine, the copper precipitation plant at the beach remained in operation. Mine waters draining from surface gloryholes and underground workings were passed through a plant in which dissolved copper was precipitated on scrap iron. The volume of mine waters ranged from 3 000 litres per minute in January to 40 000 litres per minute in June. Because of danger of flooding the townsite, a permanent hydrostatic bulkhead was placed inside the 4100 main haulage adit to control the flow of water. This was in place and monitored in 1979.

During the life of the operation, from first production in 1905 to 1977, the date of the last record of precipitated copper, the Britannia mine had milled 47 402 173 tonnes of ore, with gross metal content in concentrates of: gold, 15 336 324 grams; silver, 180 845 128 grams; copper, 516 959 750 kilograms; lead, 15 563 003 kilograms; zinc, 125 290 669 kilograms; and cadmium, 444 804 kilograms. (The copper figure includes copper contained in precipitates.) Copper concentrates solely were produced until 1933–36, when zinc concentrates also were produced. Zinc concentrates were again produced in 1947 and for the remaining life of the mine.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, GEM, 1970, pp. 233–246; MI 82G/NW-3, 36.

Britannia Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	—	Copper concentrates, 30 t; copper precipitates, 211 t	043	4 043	72 740	—	—	—
1976	292	Copper precipitate	—	—	90 124	—	—	—
1977	236	Copper precipitate clean-up	—	7 465	56 555	—	—	—

WARMAN (Fig. M-2, NTS 92, No. 60)

Vancouver M.D. Lat. 50°08′ Long. 123°06′ (92J/3E)

This property of more than 100 mineral claims is 11 kilometres north of Brandywine Falls on the east side of Callaghan Creek, 55 kilometres by road north of Squamish.

It is owned by Northair Mines Ltd., 625 Howe Street, Vancouver V6C 2T6; mine office, Box 2029, Squamish V0N 3G0. this is a comparatively new discovery, made by amateur prospectors in 1970. Development work proceeded at once. The concentrator of King Resources Ltd. west of Revelstoke was installed in 1975, and production began in 1976.

A quartz-carbonate vein zone containing galena, sphalerite, chalcopyrite, and pyrite strikes northwestward and dips steeply. It is emplaced in a series of foliated volcanic rocks including dacite, rhyodacite, and feldspar crystal tuff that form a roof pendant in granodioritic rocks of the Coast Intrusions.

Three separate zones are known, in order of discovery, as the Discovery, Manifold, and Warman, the latter found by diamond drilling in 1973. It is presumed that these are segments of a single vein system, known to be cut by many north-trending faults and by post-mineral basic dykes. There is variation throughout the length of the entire zone in terms of ore minerals, metal content, and gold-silver ratios.

Ore was mined by cut-and-fill stoping, and by shrinkage in small stopes where walls were competent. The concentrator is at the 3200 level and the main haulage adit is the 2800

(853 metres) level. The highest level is at 1 067 metres. Production includes lead concentrate, zinc concentrate, and dore bars.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, GEM, 1974, pp. 200–202; MI 92J/W-12.

Warman Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1975	526	High-grade ore, test shipments	12.690	12.379	1 485	1 185	5 504	—
1976	47 553	Lead concentrates, 876 t; zinc concentrates, 846 t; dross bars	620.131	3 864.112	—	340 681	411 021	1 782
1977	84 366	Lead concentrates, 2 489 t; zinc concentrates, 2 347 t; dore bars	1 234 043	10 341 094	—	1 217 824	1 265 112	1 354
1978	93 397	Lead concentrates, 2 782 t; zinc concentrates, 2 161 t; dore bars	1 069 386	5 708 023	100 930	1 140 032	1 464 364	—
1979	88 309	Lead concentrates, 1 712 t; zinc concentrates, 1 587 t; dore bars	954 534	1 926 052	94 186	724 866	1 106 137	—
1980	71 124	Lead concentrates, 1 779 t; zinc concentrates, 2 246 t; dore bars	584 131	1 894 138	97 203	871 219	1 246 617	—

CHAPUT (Fig. M-2, NTS 82, No. 61)

Vernon M.D. Lat. 50°16′ Long. 118°57′ (82L/7W)

This property of 24 Chaput located claims is on Bessette Creek, 2 kilometres northeast of Lumby. It is owned by Wallace and Edward Chaput of Lumby.

A quartz vein in metamorphosed rocks of Carboniferous age is mineralized with galena, sphalerite, chalcopyrite, pyrite, pyrrhotite, and some argentite.

Intermittent activities by United Mineral Services Ltd. in 1976 and 1978–80 resulted in milling 454 tonnes of ore in 1976 to produce 41 tonnes of lead concentrate. A small mill, built in previous years, is reported to have treated custom ore in addition.

Reference: MI 82L/SE-6.

Chaput Production

Year	Ore Produced tonnes	Products Shipped	Gross Metal Content					
			Gold g	Silver g	Copper kg	Lead kg	Zinc kg	Cadmium kg
1976	454	Lead concentrates, 41 t	156	206 057	654	12 746	5 485	—

NON-METALLIC MINES AND QUARRIES

ASBESTOS

CASSIAR (Fig. M-2, NTS 104, No. 62)

Liard M.D. Lat. 59°19.6′ Long. 129°49.4′ (104P/5W)

The mine is approximately 4.8 kilometres north of Cassiar townsite, on Mount McDame, between 1 680 and 2 130 metres elevation. Cassiar is 140 kilometres by road from Watson Lake, Yukon Territory.

The property of 69 mineral claims and fractions was owned by Cassiar Asbestos Corporation Limited until June 1980, when the company's name was changed to Cassiar Resources Limited. In late 1980, the latter company was acquired by Brinco Limited and became the Cassiar Division of Brinco Mining Limited, 1655 West Hastings Street, Vancouver, B.C. V6E 3V3.

The Cassiar asbestos orebody is in a sill-like mass of serpentinite intrusive into Devonian-Mississippian sedimentary rocks. The orebody strikes approximately north and dips 30 degrees to 40 degrees to the east. Numerous veinlets of chrysotile asbestos occur in light to dark green serpentine. Magnetite is fairly abundant, occurring in microscopic veinlets and larger veins. Other associated minerals include picrolite, magnesite, nemalite, brucite, tremolite, and antigorite. Approximate surface dimensions of the orebody are 230 by 460 metres (1979).

Mining has been done in a large open pit that has greatly changed the surface outline of Mount McDame. A double benching technique was employed, leaving, in waste, 27-metre benches (two lifts) and 15-metre catchments and, in ore, 18-metre benches and 11.5-metre catchments. The method has been to take a series of 46 to 76-metre slices (referred to as "phases") off the hangingwall in order to expose the orebody. In 1980, mining of ore was in Phase 8 and the lowest part of the pit was at about 1 680-metre elevation.

In 1979–80, an adit, at an elevation of 1 568 metres, was extended to a total length of 973 metres, diamond-drill stations were cut, and a total of 8 132 metres of diamond drilling was done to explore the deeper outlines of the orebody.

Ore from the pit was trucked to the primary crusher at the pit rim and conveyed by a new tramline (August 1975) almost 0.9 kilometre long, with a drop of 649 metres, to the new primary concentrator (August 1975). Approximately 30 per cent of the waste rock was screened off, and the concentrated ore was taken to the 150-tonnes-per-hour mill, where it was repeatedly crushed and screened, and asbestos fibre was drawn off by suction.

In past years the bagged fibre was hauled by truck to Whitehorse or Fort Nelson, but following completion of the Cassiar-Stewart road it was hauled to Stewart and shipped thence from a deep-sea dock.

Production: 1975–80: 506 878 tonnes of asbestos.

Reference: MI 104P-5.

BARITE

Mountain Minerals Limited, Box 700, Lethbridge, Alta. V1J 3Z6, produced from three sources south of Golden, barite that was shipped to the company's processing plant at Lethbridge:

(1) TOBY CREEK (Fig. M-2, NTS 82, No. 63)

Golden M.D. Lat. 50°20.5′ Long. 116°25.7′ (82K/8W)

At the junction of Toby Creek and Jumbo Creek, 40 kilometres from Invermere—A gravity separation plant recovered barite from tailings piles of the former Mineral King lead-zinc mine.

Reference: MI 82K/SE-1.

(2) BRISCO (Fig. M-2, NTS 82, No. 64)

Golden M.D. Lat. 50°49.9′ Long. 116°19.6′ (82K/16W)

A fault zone averaging 12 metres wide in dolomite was originally quarried, but in the period 1975–80 it was mined by underground stoping.

Reference: MI 82K/NE-13.

(3) PARSON (Fig. M-2, NTS 82, No. 65)

Golden M.D. Lat. 51°01.3′ Long. 116°39′ (82N/2E)

Two sub-parallel fissure veins, about 100 metres apart and dipping 55 degrees west, are in Lower Cambrian sedimentary rocks. A small quarry operated in 1975–76; later, barite was produced from underground stoping.

Reference: MI 82N-2.

Production figures are not available.

BUILDING STONE

The following two quarrying operations are the only ones specifically mentioned. Small amounts of stone were produced for short periods from a number of localities in the province, but for local use and on such a desultory basis that no purpose is served by describing them in this 6-year summary. Uses included ballast, riprap, granules, stucco dash, and where colours were desirable, for building facings.

Pleasingly coloured durable stone that is also fissile, to permit dressing without expensive equipment, is to be found in many highly metamorphosed terranes. Such stone has been found along the east side of Okanagan Lake, in the West Kootenay, and elsewhere. It includes platy quartzite, quartz-mica schist, gneiss, etc., and may support a "cottage industry" type of operation for facing stone, flagstones for patio and garden, and other uses. There have been several small quarries in such rocks.

PITT RIVER QUARRY (Fig. M-2, NTS 92, No. 66)

New Westminster M.D. Lat. 49°17.4′ Long. 122°39.3′ (92G/7E)

On Sheridan Hill on the east bank of Pitt River, 6 kilometres north of Pitt Meadows.

The registered owner of the land was Pitt Polder Ltd. and the operator and owner of the plant was Dillingham Corporation of Canada Ltd., 20 Brooksbank Avenue, North Vancouver, B.C. V7J 2B8.

The quarry produced quartz-diorite riprap and armour rock. Undersized material was crushed and screened to produce other marketable products. Most products were shipped by scow on the Pitt River.

The operation was intermittent, depending on demand, with a crew of about eight.

Reference: MI 92G/SE-7.

WATTS POINT QUARRY (Fig. M-2, NTS 92, No. 67)

Vancouver M.D. Lat. 49°39.2′ Long. 123°12.4′ (92G/11E)

The quarry is on the east shore of Howe Sound, 5 kilometres south of Squamish.

It was owned by CR Aggregates Sales Ltd., Box 1608, Squamish. The company went into receivership in 1979, and there was only caretaking activity in 1980.

The quarry was started in dacite rock, with the initial intention of producing high quality crushed rock for the asphalt and concrete industries, but rock was also supplied for railway ballast and other uses.

Highly fractured dacite was mined by ripping with bulldozers on a system of bench mining. Pit-run rock was crushed and screened and conveyors extended from the plant to barges and to a railway spur. From 250 000 to 600 000 tonnes was produced yearly from 1975 to late 1979.

Reference: MI 92G/NW-38.

CLAY AND SHALE

CLAYBURN INDUSTRIES LTD. (Fig. M-2, NTS 92, No. 68, 69)

New Westminster M.D.	Lat. 49°03.2′	Long. 122°17.3′	(92G/1W)
New Westminster M.D.	Lat. 49°03.5′	Long. 122°11.7′	(92G/1E)

Workings are on the southwest end of Sumas Mountain near Kilgard, 80 kilometres east of Vancouver; plant is at Abbotsford; company address, Box 160, Abbotsford V2S 5C1.

Shales of Eocene age were mined by open pit. A fireclay seam in a shallow basin at the base of the Eocene was mined from underground.

Two open pits were worked on a bench system with bench heights of 7 metres. Underground mining was by room-and-pillar method.

The mine production was fireclay, brickclay, shale, and sandstone. The plant produced face and refractory bricks; sandstone and shale were crushed and shipped as cement additive. On the average, about 10 men were employed at the mine.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, 1952, Bull. 30, Clay and Shale Deposits of British Columbia; MI 92G/SE-4, 5, 31.

HANEY BRICK AND TILE LIMITED (Fig. M-2, NTS 92, No. 70)

New Westminster M.D.	Lat. 49°12.6′	Long. 122°35.9′	(92G/2E)

Company office, Box 38, Maple Ridge V2X 7E9.

Clay was quarried from a pit adjacent to the plant on the east edge of Haney. The plant manufactured drain tile, structural tile, facebrick, common brick, flue lining, and flower pots.

Reference: MI 92G/SE-6.

DIATOMITE

CROWNITE INDUSTRIAL MINERALS LIMITED (Fig. M-2, NTS 93, No. 71)

Cariboo, M.D.	Lat. 52°57.6′	Long. 122°32.2′	(93B/15E)

Company office, Box 4159, Quesnel.

An open-pit in diatomaceous earth is 2.4 kilometres southwest of West Quesnel. This is a part of the most extensive deposits known to occur in British Columbia. Diatomite formed in what is believed to have been a series of lakes, at or near the same location, which were formed by blockage of the Fraser River in Tertiary time. The deposits are believed to be Upper Miocene in age. As a result of slumping and faulting the deposits are now in discontinuous blocks at different elevations, on the west side of the Fraser River from Alexandria, 38 kilometres south of Quesnel, to the big bend 13 kilometres north of Quesnel.

Pit operation was straightforward. Diatomaceous earth was loaded into trucks for transport to the plant near the confluence of Quesnel and Fraser Rivers. The earth was dried in a rotary kiln, pulverized, screened, sized by air elutriation, pelleted as required, and bagged for marketing.

A red, "burnt" shale near the plant was mined, treated in the same plant, and sold for numerous purposes, one of which was for making pozzolanic cement.

Diatomite production, 1975–80: 17 074 tonnes.

Reference: MI 93B-23.

GYPSUM

WINDERMERE QUARRY (Fig. M-2, NTS 82, No. 72)

Golden, M.D.	Lat. 50°30′	Long. 115°54′	(82J/5W, 12W)

The quarry, on a property of 41 Crown-granted mineral claims, is on the north fork of Windermere Creek, 12.9 kilometres east of Invermere. The secondary crushing, screening, and loading plant is beside the railway at Wilmer.

The property is owned by Westroc Industries Limited, 2650 Lakeshore Highway, Mississauga, Ontario; since 1976 it has been operated by that company.

The gypsum is of sedimentary origin, occurring as part of the Mid-Devonian sequence of dominantly calcareous rocks.

The gypsum was mined by open-pit methods, using a two-bench system. Broken ore was loaded in the pit into a portable crushing and screening unit, thence conveyed to a 365-tonne loading bin. From the bin it was hauled by large trucks over a private road, approximately 18 kilometres to the plant at Wilmer, where the gypsum was further crushed and screened and sized. The final product, from 7.5 centimetres to dust, was shipped by rail and truck to Calgary.

In the period 1975–80, 3 886 351 tonnes of gypsum was produced.

References: *B.C. Ministry of Energy, Mines & Pet. Res.*, 1954, Bull. 35; MI 82J/NW-6.

FALKLAND QUARRY (Fig. M-2, NTS 82, NO. 73)

Kamloops, M.D.	Lat. 50°30.5′	Long. 119°33′	(82L/12E)

The former gypsum quarrying operation at Falkland, between Kamloops and Vernon, was held under lease by Canada Cement Lafarge Ltd., 1051 Main Street, Vancouver; mine office, RR 2, Kamloops.

Between 1976 and 1980 a contractor broke gypsum rock in one of the existing seven small quarries, 4 kilometres from Falkland village. Intermittently, as needed, this material was trucked to the company's cement plant, 18 kilometres east of Kamloops.

Reference: MI 82L/NW-1.

JADE

NEPHRO JADE LTD. (Fig. M-2, NTS 104, No. 74)

Liard M.D.	Lat. 58°17′	Long. 128°40′	(104I/7E)

This company, 3540 West 41st Avenue, Vancouver, held JADE 1 to 6 mineral claims, and also placer mining leases to cover occurrences of jade. The base camp and scene of activity was at the north end of Provencher Lake, about 84 kilometres east of the south end of Dease Lake.

In 1976 drilling and sampling were done on outcrops of jade in situ, and on 140 jade boulders lying in talus. An average crew of six men was employed for three months, and approximately 125 tonnes of selected jade boulders was taken to Dease Lake to be transported to Vancouver.

Reference: MI 104I-65.

FAR NORTH JADE LTD. (Fig. M-2, NTS 93, No. 75)

Omineca M.D. Lat. 55°51.7′ Long. 125°51.3′ (93N/13W)

This company, also at the above address, held 34 recorded claims on the northwest slope of Mount Ogden, south of Omineca River.

Five men in a two-month period in 1976 diamond drilled 152 short holes in 87 jade masses. Approximately 73 tonnes of jade was prepared for shipment to Vancouver.

Reference: MI 93N-165.

CONTINENTAL JADE LTD. (Fig. M-2, NTS 93, No. 76)

Omineca M.D. Lat. 55°50′ Long. 125°46′ (93N/13W)

This company, 1696 West First Avenue, Vancouver, held four recorded claims on the southern slope of Mount Ogden. In a four-month period in 1967, 10 men mined 99 tonnes of raw jade and shipped 81 tonnes to Vancouver. A diamond saw was employed. Most personnel and supplies were transported by helicopter.

Reference: MI 93N-156, 157.

LIMESTONE

Limestone was produced from nine quarries for a number of uses. Four quarries, representing a large part of provincial production, were on the northern tip of Texada Island. A fifth major quarry was at Cobble Hill, north of Victoria.

Production figures given in Table 3-7E in the Annual Report of the Minister are not complete, inasmuch as the rock mined by an owner for use in its own cement plant is not shown in that table, but only rock that is used for purposes other than owners' cement manufacture.

VANANDA QUARRY (Fig. M-2, NTS 92, No. 77)

Nanaimo M.D. Lat. 49°45′ Long. 124°31.9′ (92F/15E)

On the north side of Texada Island, 2 kilometres southeast of Vananda.

Owned by Lafarge Canada Limited; operated by Canada Cement Lafarge Ltd., 1057 Main Street, Vancouver V6A 2V9.

Limestone was quarried, crushed, screened, and shipped to the company's plant at Richmond.

In 1975–80 approximately 5 700 000 tonnes was produced by a crew of 24 to 37.

Reference: MI 92F-396.

IMPERIAL QUARRY (Fig. M-2, NTS 92, No. 78)

Nanaimo M.D. Lat. 49°44.4′ Long. 124°31.7′ (92F/10E)

On the north end of Texada Island, 3.2 kilometres southeast of Vananda.

Owned and operated by Imperial Limestone Company Limited, 5427 Ohio Avenue South, Seattle, Washington 98134.

Limestone was quarried and trucked 1.2 kilometres to a crushing plant at Spratt Bay. The products included limestone, stucco dash, glass grit, and fine white sand, which were shipped by barge to Vancouver and Seattle.

In 1975–80 approximately 1 200 000 tonnes was produced, with an average crew of 15.

Reference: MI 92F-394.

IDEAL QUARRY (Fig. M-2, NTS 92, No. 79)

Nanaimo M.D. Lat. 49°42.9′ Long. 124°33.8′ (92F/10E)

On the north end of Texada Island, 4 kilometres south of Vananda.

Owned and operated by Ideal Basic Industries, Rock Products Division, 1200 West Pender Street, Vancouver V6E 2S9.

Limestone was quarried and truck hauled to a processing plant at Westside, following closure of the old plant at Marble Bay.

In 1975–80 approximately 7 460 000 tonnes was produced with a crew of up to 51 men.

Reference: MI 92F-395.

DOMTAR QUARRY (Fig. M-2, NTS 92, No. 80)

Nanaimo M.D. Lat. 49°47.2′ Long. 124°37.1′ (92F/15E)

On the north end of Texada Island, 1 kilometre south of Blubber Bay.

Owned and operated by Domtar Chemicals Limited (Lime Division), 470 Granville Street, Vancouver.

In 1975–80 approximately 4 172 000 tonnes was quarried, sized, and shipped by barge to the company's plant in Tacoma.

Reference: MI 92F-397.

COBBLE HILL QUARRY (Fig. M-2, NTS 92, No. 81)

Victoria M.D. Lat. 48°40.6′ Long. 123°37.4′ (92B/12E)

At the southwest corner of Cobble Hill, 3 kilometres southwest of Cobble Hill Station.

Owned by British Columbia Cement Company Limited, RR 1, Mill Bay.

Most of the production was trucked on a private road to the company's cement plant at Bamberton.

In 1975–80 total production of the quarry amounted to approximately 4 000 000 tonnes.

Late in 1980 it was decided to close the quarry permanently.

Reference: MI 92B/NW and 92B/SW-17, 18.

HARPER RANCH QUARRY (Fig. M-2, NTS 92, No. 82)

Kamloops M.D. Lat. 50°40.3′ Long. 120°03.9′ (92I/9E)

On the north side of the South Thompson River, 17 kilometres east of Kamloops. The quarry is 1 kilometre north of the cement plant.

Owned by Canada Cement Lafarge Ltd., 1051 Main Street, Vancouver; operated, under contract, by Plateau Construction Limited, Kamloops, with a crew of six.

In 1975–80 total production of the quarry was approximately 1 580 000 tonnes.

Reference: MI 92I/NE-1.

PAVILION LAKE QUARRY (Fig. M-2, NTS 92, No. 83)

Kamloops M.D. Lat. 50°49′ Long. 121°39′ (92I/13E)

Near the eastern entrance to Marble Canyon, 35 kilometres west of the Cariboo highway, within the boundaries of Pavilion Indian Reserves 3 and 4.

Land owned by the Pavilion Indian Band, was operated by Steel Brothers Canada Limited, Richmond; local office, Cache Creek. This company owned the machinery and calcining plant.

High calcium limestone of chemical grade was crushed, sized, and the minus 5 plus 1 centimetre product was fired in an oil-fired rotary kiln for calcining. The resultant calcium oxide was put in storage bins for sale, but could be crushed and rescreened to meet customer specification. The majority of the 18 to 21 employees were natives living in the near vicinity.

PTARMIGAN CREEK QUARRY (Fig. M-2, NTS 93, No. 84)

Cariboo M.D. Lat. 53°41.1′ Long. 120°54′ (93H/11E)

On the east bank of Ptarmigan Creek, near Urling station on the Canadian National Railway, approximately 128 kilometres east of Prince George as the crow flies.

A band of Lower Cambrian limestone is on ground owned by the Canadian National Railway Company. The band, 30 metres in thickness, was quarried and treated in a crushing, screening, and washing plant. Washed and sized crushed limestone was shipped to Prince George pulp mills. Riprap and crushed limestone for ballast were also shipped by rail.

Reference: MI 93H-17.

DAHL LAKE QUARRY (Fig. M-2, NTS 93, No. 85)

Cariboo M.D. Lat. 53°47.5′ Long. 123°17′ (93G/14W)

At the northeast corner of Dahl Lake, 35 kilometres southwest of Prince George. On District Lot 3474, owned by Northrock Industries Ltd., 3905—18th Avenue, Prince George.

Limestone was quarried, and treated in a crushing, screening, and washing plant, by five men in the summer of 1979.

Reference: MI 93G-32.

MARL

CHEAM MARL PRODUCTS LIMITED (Fig. M-2, NTS 92, No. 86)

New Westminster M.D. Lat. 49°11.5′ Long. 121°44.8′ (92H/4E)

Address, 13 Fletcher Street, Chilliwack.

A deposit of marl, 2 to 3 metres thick, is mined from the bed of the former Cheam Lake, near Popkum. The marl was deposited in the lake bed in postglacial times and has been exposed since the lake was drained in 1952. Marl was mined by dragline after about a metre of clayey overburden was removed, and trucked to an asphalt drainage pad for air drying. The dried marl was sold as agricultural lime.

About 82 000 tonnes was produced in the 1975–80 period.

Reference: MI 92H/SW-106.

SILICA

BUSE LAKE QUARRY (Fig. M-2, NTS 92, No. 87)

Kamloops M.D. Lat. 50°37.3′ Long. 120°01.5′ (92I/9E)

The quarry is at Buse Lake, 11 kilometres south of the cement plant, which is on the north bank of South Thompson River, approximately 17.5 kilometres east of Kamloops.

It is owned by Canada Cement Lafarge Ltd., 1051 Main Street, Vancouver. In 1975–80 it was operated under contract by Plateau Construction Limited.

The quarry is in a volcanic tuff of Miocene age and the product is used as a cement additive. Rock is blasted and hauled to the company's Harper Ranch quarry, where it is crushed before haulage to the cement plant.

The quarry is operated by three men as often as is necessary to produce about 27 000 tonnes per year.

Reference: MI 92I/NE-123.

HUNT SILICA (Fig. M-2, NTS 82, No. 88)

Golden M.D. Lat. 51°12.6′ Long. 116°51.8′ (82N/2W)

The property is on the western slope of the Rocky Mountains on the south bank of Horse Creek, and is 3.2 kilometres from the highway, 12.9 kilometres southeast of Golden.

It is owned by C. Warren Hunt, 1119 Sydenham Road SW., Calgary and is operated by The Hanna Nickel Company, Box 85, Riddle, Oregon 97469 for their plant at Wenatchee, Washington.

The quarry is of recent development. It is in Wonah quartzite with a high silica content. Broken rock is trucked to a crushing and washing plant and the product shipped by rail.

The output in 1980 was approximately 2 000 tonnes.

Reference: MI 82N-43.

FS SILICA (Fig. M-2, NTS 82, No. 89)

Kamloops M.D. Lat. 50°48.8′ Long. 119°49.8′ (82L/13E)

A new quarry on a quartz vein on Niskonlith Creek, near Chase, was owned by Interior Stone and Marble Ltd., Box 2070, Kamloops.

Work in 1980 consisted of stripping the vein and construction of a crushing plant. Some silica was blasted and crushed at the end of the year, and trucked to the railway at Chase.

Reference: MI 82L/NW-31.

PACIFIC SILICA (Fig. M-2, NTS 82, No. 90)

Osoyoos M.D. Lat. 49°11.6′ Long. 119°33.4′ (82E/4E)

On the highway, 1 kilometre north of Oliver is the old Gypo Crown-granted mineral claim, owned for many years by Cominco.

In 1978–80 a small crew of Pacific Silica Products, Box 863, Osoyoos processed the dumps of former operations, and salvaged silica remnants in former mined areas.

Reference: MI 82E/SW-84.

MOBERLY SILICA (Fig. M-2, NTS 82, No. 91)

Golden M.D. Lat. 51°22′ Long. 116°57.9′ (82N/7W)

On Mount Moberly near Hospital Creek, nine kilometres north of Golden.

Owned by Mountain Minerals Limited, 529 Sixth Street South, Lethbridge, Alberta T1J 3Z6.

Silica sand was produced from friable sections of Wonah quartzite. It was a new operation, not in full production in 1980. Sand was trucked to a dry crushing and screening plant beside the highway, 14.5 kilometres from Golden, from which the products were shipped to markets by rail and truck. The plant was capable of processing 300 000 tonnes per year. Reference: MI 82N-1.

MOUNT ROSE SILICA (Fig. M-2, NTS 82, No. 92)

Vernon M.D.	Lat. 50°26.6′	Long. 119°16.9′	(82L/6W)

The property is on Mount Rose, 6 kilometres west of Armstrong.

It is owned and operated by Mount Rose Mining Co. Ltd., Vernon.

A quarry was started on a quartz vein in a quartz-diorite intrusion in phyllite. In 1975 approximately 800 tonnes was blasted from a 4.5 to 6-metre high face for transportation to a crushing and screening plant at the end of the access road. In succeeding years it appears that small tonnages of hand-picked material was shipped for metallurgical use. Reference: MI 82L/SW-66.

COAL MINES

BYRON CREEK COLLIERIES LIMITED (Fig. M-2, NTS 82, No. 93)

Fort Steele M.D. Lat. 49°30′ Long. 114°40′ (82G/10E)

On Coal Mountain, extending approximately 5 kilometres south of the old townsite of Corbin. Lots 6997 and 6999 (private coal land).

Byron Creek Collieries Limited, Box 270, Blairmore, Alberta is a wholly owned subsidiary of Esso Minerals Canada.

Kootenay Formation coal seams occur in complex multiple synclines controlled by folded reverse faults and imbricate slices. There are at least two mineable seams which are deformed and thickened.

Thick lenses of coal were mined from mid-1974 to 1980 by open-pit mining. Coal was trucked to a cleaning plant at Corbin, erected in 1974, and clean coal was trucked 20 kilometres north to the railway at McGillivray. In 1977 a start was made to build a rail extension to Corbin, and a new cleaning plant was erected with a capacity of 320 tonnes per hour; a conveyor was built from the plant to the load-out area.

Production in 1975–80 was 3 225 788 tonnes of clean thermal coal.

Reference: MI 82G/NW-51.

COLEMAN COLLIERIES LTD. (Tent Mountain) (Fig. M-2, NTS 82, No. 94)

Fort Steele M.D. Lat. 49°33′ Long. 114°42.5′ (82G/10E)

This company, 715, Fifth Avenue SW., Calgary T2P 2X7 operates a mine on Tent Mountain, partly in Alberta and partly in British Columbia. It is 20 kilometres by road in Alberta, from Highway 3 at Crowsnest Pass. Coal Licences 21 and 22.

There appear to be five significant coal seams in the Kootenay Formation, but thrust faulting makes correlation difficult. The seams dip steeply.

Open-pit mining on Tent Mountain has been done for about 30 years, chiefly on the Alberta side of the provincial boundary, but also on the British Columbia side at elevations as high as 2 195 metres, wherever a seam extended into British Columbia.

Production from 1975 was first from No. 3 pit and later from No. 5 pit, which was completed in 1980. Raw coal was trucked to the preparation plant at Coleman, Alberta.

Production in 1975–80 was 1 463 558 tonnes of clean metallurgical coal.

FORDING COAL LIMITED (Fig. M-2, NTS 82, No. 95)

Fort Steele M.D. Lat. 50°11.4′ Long. 114°52.5′ (82J/2W)

The plant site is in the upper Fording River valley, 68 kilometres north of Sparwood, and the mines are on both sides of the valley. A railway spur line reaches the preparation plant.

In 1977, Fording Coal Limited merged with CanPac Minerals to form the present company, 60 per cent owned by Canadian Pacific Investments and 40 per cent by Cominco Ltd. It is managed by Cominco; mine office, Box 150, Elko, V0B 1H0.

The coal seams are in the Kootenay Formation in two north-trending synclines on either side of the Erickson fault which follows the Fording River valley. No. 4 or B seam is the thickest on the property, with a mean thickness of 10.7 metres and in places 18 metres. Total mean thickness of mineable seams is approximately 55 metres in the Greenhills area and 50 metres in the Clode Creek area. There are at least 10 seams of appreciable thickness.

The plant site is at 1 675-metre elevation and workings are as high as 2 135 metres. Production was by open-pit mining, although development of a hydraulic underground mine on Eagle Mountain east of the valley, started in 1975 and was reactivated in 1980.

The largest producer was the Clode pit, on the east side of the valley. It was a truck-shovel operation. The other major source of coal was the Greenhills pit on the west side of the valley. It was mined by dragline shovel and to a limited extent by truck-shovel method. Small production came from the Turnbull pit on Mount Turnbull. In 1980, production was listed from the Taylor and Blackwood pits. The Taylor pit was developed in 1978.

A good deal of exploration drilling was done in 1975 and 1976 within a 3.5-kilometre radius of the preparation plant, to ensure continuing productivity. At the same time, improvements at the plant site were carried out.

Production in 1975–80 was 16 512 356 tonnes of clean metallurgical coal.

Reference: MI 82J/SW and SE-11.

KAISER RESOURCES LTD. (Sparwood and Michel) (Fig. M-2, NTS 82, No. 96)

Fort Steele M.D. Lat. 49°45′ Long. 114°49.5′ (82G/10W, 15W)

In January 1981, the name of this company was changed to B.C. Coal Ltd., 1500 West Georgia Street, Vancouver V6B 2Z8. British Columbia Resources Investment Corporation acquired control of Kaiser Resources Ltd., and formed the present company, 66 per cent owned by British Columbia Resources and 33 per cent by Mitsubishi Corporation and other Japanese interests.

B.C. Coal Ltd. owns extensive freehold and Crown coal properties on the Elk River and on Michel Creek and Flathead and Fording Rivers, lying chiefly in the Fernie coal basin. All of the coal is within the Kootenay Formation, which contains up to 10 coal seams with an aggregate thickness in excess of 45 metres.

In the period 1975–80, virtually all coal production was from the Balmer No. 10 seam, 13 to 15 metres thick, near the base of the Kootenay Formation. Exploration was undertaken at the Greenhills project, on the southern part of a mountainous ridge between the Elk and Fording Rivers, and in 1980 the Greenhills property was being prepared for production.

Northeast of Sparwood, on Harmer Ridge, the Harmer open-pit operations are in a deformed thrust plate on the west limb of a syncline; the westerly extent of the pits is governed by the West Harmer fault. Two underground mines are on Michel Creek. The Balmer North mine is on the east limb of the same syncline, where dips are about 20 degrees. The Hydraulic mine is on the west limb of the syncline, below Sparwood Ridge, where dips are about 35 to 45 degrees.

The main activity was at Harmer Ridge, where as many as eight open pits have been worked, and the coal conveyed to a cleaning plant through a tunnel under the ridge. In 1979 an underground mine was worked on the Baldy No. 7 seam, but it was later decided that further mining of that seam would be from an extension of the present open-pit operation.

Underground mining was continuous at the Balmer North mine. At the Hydraulic mine, Panel 6 was developed and production started from it in 1978. Panel 5 of the Hydraulic mine was worked out in 1980.

The Elkview preparation plant north of Sparwood treated raw coal delivered by conveyor tunnel from the Harmer mine, and by truck from the underground mines. In 1980, improvements and extensions were made to the plant, from which coal was loaded directly to railway cars for transport to the company-owned deep-sea loading facility at Roberts Bank.

The tipple and screening plant at Michel, which for years had treated coal from that vicinity, was demolished in 1980. The Michel coke plant was in operation through 1975–80.

Total production from surface and underground mining in 1975–80 was 34 251 237 tonnes of clean metallurgical coal. Of this total, approximately 6 per cent was thermal coal.

Reference: MI 82G/NW-47, 50.

BULKLEY VALLEY COLLIERIES LIMITED (Telkwa) (Fig. M-2, NTS 93, No. 97)

Omineca M.D. Lat. 54°38′ Long. 127°07′ (93L/11E)

This company holds property on Goathorn Creek, 11 kilometres southwest of Telkwa.

Beds of probable Hazelton age dip for the most part at a moderate angle to the northeast, but there is some folding, and some dips are as steep as 45 degrees. Faults are common.

Coal for local markets has been mined from adits and small pits. Most of the production in 1975-80 was mined underground. Coal sold to local markets in the 6-year period amounted to 1 320 tonnes.

Reference: MI 93L-152 to 156.

Table M-1—Metal Production, 1975

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
Alberni Mining Division			t		kg	kg	kg	kg	kg	kg
Lynx and Myra	Buttle Lake	Western Mines Ltd.	260 717	Copper concentrates, 7 892 t; lead concentrates, 6 767 t; zinc concentrates. 30 597 t	642.837	35 977.151	2 707 398	3 459 337	18 090 898	70 372
Musketeer	Tofino	New Musketeer Gold Mine Ltd.	7	Crude ore	.435	.280	4			
Privateer	Zeballos	New Privateer Gold Mines Ltd.	7	Crude ore	.467	.373				
Atlin Mining Division										
Atlin-Ruffner	Atlin	Atlin Silver Corp.	137	Crude ore	.607	313.518		18 386		
Cariboo Mining Division										
Boss Mountain mine	Big Timothy Mountain	Noranda Mines Ltd. (Boss Mountain Div.)	545 496	Molybdenite concentrates, 1 927 t; containing 1 094 002 kg of molybdenum						
Gibraltar mine	McLeese Lake	Gibraltar Mines Ltd.	10 388 118	Copper concentrates, 155 736 t; molybdenite concentrates, 470 t; containing 251 672 kg of molybdenum		5 391.611	41 165 032			
Clinton Mining Division										
Nil										
Fort Steele Mining Division										
Dardenelle, Mother Lode	Wild Horse River	Magnum Enterprises Ltd.	43	Crude ore	1.061	2.805		2 110	65	
Sullivan mine	Kimberley	Cominco Ltd.	2 002 916	Lead concentrates, 91 131 t; zinc concentrates, 151 683 t; tin concentrates, 49 t, containing 24 868 kg of tin	5.132	73 570.507	437 533	68 047 946	75 418 513	34 701
Golden Mining Division										
Ruth Vermont	Spillimacheen	Consolidated Columbia River Mines Ltd.	10 258	Lead concentrates, 356 t; zinc concentrates, 342 t	.453	1 110.066	3 414	210 279	217 213	1 385

Table M-1—Metal Production, 1975—Continued

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
			t		kg	kg	kg	kg	kg	kg
Greenwood Mining Division										
Burnt Basin	Paulson	Alvija Mines Ltd.	786	Lead concentrates, 25 t; zinc concentrates, 98 t	.....	49.235	.....	23 223	37 825	253
Denero Grande, Jewel	Greenwood	Colt Resources Ltd.	1 859	Crude ore	17.698	108.643	.....	4 912	2 122	.....
Highland Bell mine	Beaverdell	Teck Corporation Ltd.	34 898	Lead concentrates, 704 t; zinc concentrates, 239 t; jig concentrates, 33 t	4.852	11 131.172	.....	132 745	136 173	1 304
Phoenix mine	Greenwood	Granby Mining Corp., Phoenix Copper Div.	985 875	Copper concentrates, 15 797 t	366.978	3 657.215	4 220 275	.....	.....	.....
Marshall	Greenwood	San Jacinto Explorations Ltd.	176	Crude ore	3.266	3.017	.....	176	176	.....
Skomac	Greenwood	Robert Mines Ltd.	434	Crude ore	2.146	301.606	.....	13 067	8 439	.....
Kamloops Mining Division										
Bethlehem	Highland Valley	Bethlehem Copper Corp.	5 864 500	Copper concentrates, 66 257 t	20.061	4 206.432	22 154 586	.....	.....	.....
Lornex mine	Highland Valley	Lornex Mining Corp. Ltd.	11 696 413	Copper concentrates, 154 294 t; molybdenite concentrates, 2 608 t, containing 1 406 082 kg of molybdenum	7.745	130 042.545	50 239 447	.....	.....	.....
Lucky Coon	Adams Plateau	K. Viney Contracting Co. Ltd.	424	Crude ore; lead concentrates, 25 t	.439	.316	.....	69 705	7 416	3 708
Liard Mining Division										
Magnum mine	Delano Creek	Consolidated Churchill Copper Corp. Ltd.[1]	.....	Copper concentrates, 2 887 t	.....	.....	808 665	.....	.....	.....
Lillooet Mining Division										
Nil	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nanaimo Mining Division										
Island Copper mine	Rupert Inlet	Utah Mines Ltd.	12 075 145	Copper concentrates, 201 322 t; molybdenite concentrates, 1 485 t, containing 615 313 kg of molybdenum; rhenium shipments are confidential	1 705.595	8 996.170	47 514 467	.....	.....	.....
Texada mine	Texada Island	Texada Mines Ltd.	906 730	Iron concentrates, 296 250 t; copper concentrates, 7 426 t	45.597	1 385.359	1 635 716	.....	.....	.....
Nelson Mining Division										
Annex	Nelway	Reeves MacDonald Mines Ltd.	32 211	Lead concentrates, 273 t; zinc concentrates, 1 604 t	.....	296.847	.....	151 543	850 479	7 924
H.B.	Salmo	Cominco Ltd.	411 084	Lead concentrates, 4 950 t; zinc concentrates, 22 878 t	.622	1 130.314	.....	1 666 762	12 480 257	96 325
Mother Lode	Salmo	Nugget Mines Ltd.	484	Siliceous ore, dump clean-up	3.919	34.462	.....	.....	.....	.....

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[1] No report received, quantities estimated.

New Westminster Mining Division										
Nil										
Nicola Mining Division										
Craigmont mine	Merritt	Craigmont Mines Ltd.	1 774 731	Copper concenrates, 69 996 t; iron concentrates, 41 145 t	26.997		20 564 778			
Omineca Mining Division										
Bell mine (Newman)	Babine Lake	Noranda Mines Ltd. (Bell Copper Div.)	4 335 049	Copper concentrates, 63 283 t	739.069	2 061.227	16 466 056			
Endako mine	Endako	Canex Placer Ltd. (Endako Mines Div.)	8 543 821	Molybdenite concentrates, 1 488 t; molybdenum trioxide, 7 975 t; ferromolybdenum, 117 t; total content, 5 564 104 kg of molybdenum						
Granisle mine	Babine Lake	Granisle Copper Ltd.	4 475 103	Copper concentrates, 55 294 t	552.140	4 982.701	17 034 399			
Pinchi Lake mine	Pinchi Lake	Cominco Ltd.	(2)	Mercury						
Silver Standard mine	Hazelton	George Braun, New Hazelton	133	Crude ore	.218	189.386		4 352	4 523	
Sunrise	Hazelton	Sunrise Silver Mines Ltd.	40	Crude ore		45.597		4 867	4 908	
Tetra (Moricetown Silver)	Smithers	Paul Kindrat, Smithers	60	Crude ore	.084	212.185		2 612		
Osoyoos Mining Division										
Brenda mine	Brenda Lake	Brenda Mines Ltd.	9 115 839	Copper concentrates, 52 314 t; molybdenite concentrates, 6 511 t; molybdic oxide, 725 t; total content, 4 074 073 kg of molybdenum	125.718	7 872.511	15 101 190			
Dusty Mac	Okanagan Falls	Dusty Mac Mines Ltd.	39 940[3]	Gold-silver	239.431	4 293.240	740	1 066		
Horn Silver mine	Keremeos	Dankoe Mines Ltd.	17 916	Silver concentrates, 792 t	11.010	8 120.682	5 013	18 058	25 102	
Susie	Oliver	Hem Mines Ltd.	7 365	Crude ore	43.762	779.752	3 080	25 434	11 974	
Revelstoke Mining Division										
Henry	Trout Lake	A. Chilton, Nakusp	32	Crude ore		55.177		1 660	255	
Similkameen Mining Division										
Similkameen mine (Ingerbelle)	Princeton	Similkameen Mining Co. Ltd.	3 693 900	Copper concentrates, 46 865 t	574.783	2 551.006	12 768 721			

Table M-1—Metal Production, 1975—Continued

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
			t		kg	kg	kg	kg	kg	kg
Skeena Mining Division										
Babe	Port Clements, Q.C.I.	E. Specogna, Nanaimo	6	Crude ore	.902	.529				
Goat	Surprise Creek, Stewart	Nordore Mining Co. Ltd.	16	Crude ore		15.925		67	352	
Granduc mine	Stewart	Granduc Operating Co.	1 499 585	Copper concentrates, 56 813 t	162.606	9 604.482	16 222 977			
Tasu mine	Tasu Sound	Wesfrob Mines Ltd.	1 622 385	Iron concentrates, 946 719 t; copper concentrates, 7 934 t	42.238	1 720.991	1 499 933			
View Fraction	Stewart	N. Benkovich, Stewart	136	Crude ore	6.322	150.781	1 020	6 919	6 493	
Slocan Mining Division										
Antoine	McGrugan Creek	W. Turley, Kaslo	144	Crude ore		92.127		5 191	13 217	
Arlington	Slocan	W. Storegaard and R. Salisbury, Slocan	120	Crude ore		44.384		6 679	8 317	
Bluebell	Riondell	D. Pearce, Nelson	Salvage	Lead concentrates, 21 t; zinc concentrates, 32 t		53.902		11 957	14 648	101
Eastmont	Enterprise Creek	G. B. Bandeen, New Denver	62	Crude ore		39.470		2 654	4 012	
Enterprise	Enterprise Creek	Malamute Holdings Ltd. and T. Mazur, Calgary	263	Crude ore	.093	139.715		7 495	29 616	
Galena Farm	Silverton	R. Mills and W. Mengler, Silverton	25	Crude ore		3.235		272	7 645	
Hecla	Silverton	R. Mills and W. Mengler, Silverton	12	Crude ore		55.301		2 651	1 106	
Jackson Basin	West side Arrow Lake	Fostall Mines Ltd.	57	Crude ore		6.376		2 284	17 245	
Jesse	Silverton	W. Mengler, Silverton	2	Crude ore		4.323	11			
Kalispell	Enterprise Creek	P. Leontowicz	36	Dump clean-up		3.763		323	143	
Little Tim	Slocan City	D. Nebor, Slocan, and W. Turley, Kaslo	21	Crude ore		60.869		1 699	1 152	
Morning Star	Slocan City	Louis de Kock	36	Crude ore	.435	1.400				
Ottawa	Springer Creek	C. Thickett, Slocan City	12	Crude ore		105.532		82	35	
Panama, Silver Glana	New Denver	United Hearne Resources Ltd.	379	Crude ore		360.546		1 438	1 187	
Scranton	Kaslo	Star Syndicate	1 611	Lead concentrates, 99 t; zinc concentrates, 114 t	4.821	214.828		76 844	64 622	1 338
Shannon	Slocan Lake	A. F. Strebchuk, Hills	20	Crude ore	.629	11.228		2 332	2 685	
Silmonac (Minniehaha)	Slocan Lake	Kam-Kotia and Burkam Joint Venture	10 928	Lead concentrates, 982 t; zinc concentrates, 757 t		6 228.905		591 365	471 192	2 940
Victor	New Denver	E. Perepolkin and N. Wolinski, Sandon	29	Crude ore from stockpile		34.555		2 540	2 680	
White Water	Retallack	P. Leontowicz and D. Bialkoski, New Denver	75	Crude ore, dump clean-up	.109	96.233		8 755	19 214	

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[2] Confidential.

[3] Shipped to Danko Mines Ltd. for milling.

Trail Creek Mining Division										
Blue Bird	Rossland	Standonray Mines Ltd.	1 358	Crude ore; silver concentrates, 91 t	2.809	1 173.005	......	46 333	51 846	......
Midnight	Rossland	Sand Mines Ltd.	313	Crude ore	4.417	8.336	......	......	......	......
Vancouver Mining Division										
Britannia mine	Howe Sound	Anaconda Canada Ltd.		Copper concentrates, 30 t; copper precipitates, 211 t	.043	4.043	72 740	......	......	......
Warman (Northair)	Callaghan Creek	Northair Mines Ltd.	526	High grade ore, test shipments	12.690	12.379	1 485	1 185	5 504	......
Vernon Mining Division										
Nil	......	......	......	......	......	......	......	......	......	......
Victoria Mining Division										
Sunro mine	River Jordan	Jordan River Mines Ltd.	......	Copper concentrates, 213 t; from stockpile	.902	9.331	53 735	......	......	......

Table M-1—Metal Production, 1976

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
Alberni Mining Division			t		kg	kg	kg	kg	kg	kg
Lynx and Myra	Buttle Lake	Western Mines Ltd.	269 293	Copper concentrates, 8 830 t; lead concentrates, 7 093 t; zinc concentrates, 31 653 t	695.494	40 435.642	2 953 251	3 586 262	18 987 531	72 800
Atlin Mining Division										
Atlin-Ruffner	Atlin	Atlin Silver Corp.	1 610	Lead concentrates, 64 t	.678	429.843	376	34 455	4 017	......
Cariboo Mining Division										
Boss Mountain Mine	Big Timothy Mountain	Noranda Mines Ltd. (Boss Mountain Division)	564 036	Molybdenite concentrates, 1 843 t containing 1 022 697 kg of molybdenum	......	......	......	......	......	......
Gibraltar Mine	McLeese Lake	Gibraltar Mines Ltd.	7 672 296[1]	Copper concentrates, 101 772 t	......	3 343.168	26 142 438	......	......	......
Clinton Mining Division										
Nil	......	......	......	......	......	......	......	......	......	......
Fort Steele Mining Division										
Sullivan Mine	Kimberley	Cominco Ltd.	2 124 886	Lead concentrates, 109 140 t; zinc concentrates, 151 636 t; tin concentrates, 125 t containing 66 183 kg of tin	......	84 586.817	......	77 065 578	77 435 404	......
Golden Mining Division										
Ruth Vermont	Spillimacheen	Consolidated Columbia River Mines Ltd.	60 725[2]	Lead concentrates, 1 504 t; zinc concentrates, 2 244 t	2.830	5 025.312	14 435	949 099	1 276 240	9 003
Greenwood Mining Division										
Burnt Basin	Paulson	Donna Mines Ltd. and Alvija Mines Ltd.	573	Lead concentrates, 33 t; zinc concentrates, 56 t	......	35.209	......	18 714	27 897	142
Highland Bell Mine	Beaverdell	Teck Corporation Ltd.	34 447	Lead concentrates, 733 t; zinc concentrates, 299 t; jig concentrates, 103 t	5.536	11 583.379	......	147 978	186 168	1 219
Phoenix Mine	Greenwood	Granby Mining Corp., Phoenix Copper Division	965 845	Copper concentrates, 15 435 t	364.620	3 261.367	4 231 760	......	......	......
Skomac	Greenwood	Robert Mines Ltd.	548	Crude ore	1.327	221.355	......	16 122	8 651	......
Kamloops Mining Division										
Bethlehem	Highland Valley	Bethlehem Copper Corp.	6 763 838	Copper concentrates, 64 781 t	57.230	4 618.236	23 006 380	......	......	......
Lornex Mine	Highland Valley	Lornex Mining Corp. Ltd.	15 436 575	Copper concentrates, 204 020 t; molybdenite concentrates, 3 133 t, containing 1 715 590 kg of molybdenum	26.851	17 316.751	68 313 748	......	......	......
Spar 1 and Spar 2	Adams Plateau	Panex Mining Ltd.	181	Crude ore	.062	91.567	291	5 667	2 438	......

Liard Mining Division										
Nil										
Lillooet Mining Division										
Nil										
Nanaimo Mining Division										
Island Copper Mine	Rupert Inlet	Utah Mines Ltd.	12 246 885	Copper concentrates, 213 588 t; molybdenite concentrates, 2 145 t, containing 878 072 kg of molybdenum; rhenium shipments are confidential	1 416.959	9 983.690	48 956 470			
Texada Mine	Texada Island	Texada Mines Ltd.	848 477	Iron concentrates, 368 412 t; copper concentrates, 6 394 t	33.687	1 337.149	1 332 202			
Nelson Mining Division										
HB	Salmo	Cominco Ltd.	374 163	Lead concentrates, 5 082 t; zinc concentrates, 23 106 t	.684	937.071	274	2 036 925	12 796 512	104 523
Mohawk No. 1	Salmo	J. Elmer, Creston	40	Crude ore		4.945		1.030	30	12
New Westminster Mining Division										
Nil										
Nicola Mining Division										
Craigmont Mine	Merritt	Craigmont Mines Ltd.	1 763 219	Copper concentrates, 74 310 t; iron concentrates, 32 564 t	7.838		21 107 071			
Omineca Mining Division										
Bell Mine (Newman)	Babine Lake	Noranda Mines Ltd. (Bell Copper Division)	1 925 246	Copper concentrates, 25 748 t	295.292	823.265	6 651 253			
Endako Mine	Endako	Canex Placer Ltd. (Endako Mines Division)	8 520 235	Molybdenite concentrates, 1 098 t; molybdic tri-oxide, 9 771; ferro-molybdenum, 288 t; total content 6 766 374 kg of molybdenum						
Granisle Mine	Babine Lake	Granisle Copper Ltd.	4 008 222	Copper concentrates, 45 482 t	408.227	4 549.902	14 672 658			
Silver Standard Mine	Hazelton	George Braun, New Hazelton	152	Crude ore	.746	255.791	245	8 842	12 759	
Tetra (Moricetown Silver)	Smithers	Paul Kindrat, Smithers	189	Crude ore	.317	485.767		7 145	6 240	
Osoyoos Mining Division										
Brenda Mine	Brenda Lake	Brenda Mines Ltd.	10 047 565	Copper concentrates, 51 854 t; molybdenite concentrates, 6 514 t; molybdic oxide, 132 t; total content, 3 705 953 kg of molybdenum	123.697	7 891.360	14 562 834			
Dusty Mac	Okanagan Falls	Dusty Mac Mines Ltd.	53 335	Gold-silver concentrates, 636 t	364.336	6 210.336	1 692	1 053		
Hill	Osoyoos	D. C. Baxter, West Vancouver	3	Crude ore	.031	.029		3	3	
Horn Silver Mine	Keremeos	Dankoe Mines Ltd.	20 936	Silver concentrates, 661 t	20.292	6 988.937	4 127	17 657	22 143	
Susie	Oliver	Hem Mines Ltd.	3 039	Crude ore	12.535	233.273	943	10 995	4 295	

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[1] Includes 172 356 t from Cuisson Lake Mine.
[2] Estimated.

Table M-1—Metal Production, 1976—Continued

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content: Gold	Silver	Copper	Lead	Zinc	Cadmium
			t		kg	kg	kg	kg	kg	kg
Revelstoke Mining Division										
Lucky Boy	Trout Lake	A. Marlow, Ferguson	24	Crude ore		17.884	49	1 675	1 887	
Similkameen Mining Division										
Similkameen Mine (Ingerbelle)	Princeton	Newmont Mines Ltd. (Similkameen Division)	6 355 874	Copper concentrates, 91 211 t	1 198.523	4 814.153	25 045 931			
Skeena Mining Division										
Granduc Mine	Stewart	Newmont Mines Ltd. (Granduc Operating Division)	1 315 905	Copper concentrates, 54 894 t	154.800	10 373.566	15 569 210			
Oxedental and Terminus	Stewart	N. Benkovich, Stewart	39	Crude ore	.425	32.106	120	2 628	2 164	
Silbak Premier	Premier	Spring Investments Ltd.	73	Crude ore	2.115	62.984		1 903	2 541	
Tasu	Tasu Sound	Wesfrob Mines Ltd.	1 572 524	Iron concentrates, 837 813 t; copper concentrates, 11 641 t	59.002	2 406.781	2 265 207			
Slocan Mining Division										
Arkansas	Ainsworth	D. Bialkoski, Slocan	39	Crude ore		4.541		1 127	4 079	
Arlington	Slocan	Selmon Resources Ltd.	21	Lead concentrates salvaged from dump	.062	170.258		6 680	4 185	
Bluebell	Riondell	D. Pearce, Nelson	119	Salvaged zinc concentrates and tailings		18.475		6 099	20 471	
Bosun	New Denver	A. E. Avison, Kamloops	13	Crude ore		8.958		546	1 959	
Chief	Mt. Rupple	N. Block, Nelson	3	Crude ore	.018	16.773	9	167	7	
Enterprise	Enterprise Creek	T. Mazar, Calgary	28	Crude ore		15.676		541	826	
Gladstone	New Denver	W. Turley, Kaslo	9	Crude ore		41.056		3 493	1 933	
Hewitt	Silverton	F. Pho, New Denver	855	Lead concentrates, 41 t; zinc concentrates, 89 t		325.493		24 039	47 632	332
Jesse	Silverton	R. Leighton, Sorrento	24	Crude ore		6.127		188	70	
Leo No. 1 and No. 2 Fraction	New Denver	E.M.U. Enterprises	3	Crude ore		3.390		79	51	
Lucky Boy	Kaslo	L. Garland, Kaslo	2	Crude ore		11.353		1 942	94	
Lucky Spot	Silverton	J. Nesbitt and S. Berisoff, Silverton	44	Crude ore		141.674		11 059	8 458	
Moose	Silverton	D. Pengally, Silverton	9	Crude ore		16.111		3 553	1 352	
Ottawa	Springer Creek	C. Thickett, Slocan	1 348	Silver concentrates, 13 t; crude ore, 11 t	.018	999.402	226	1 623	1 169	
Panama, Silver Glance	New Denver	United Hearne Resources Ltd.	184	Crude ore	.063	162.451		919	736	
Scranton	Kaslo	Star Syndicate	4 767	Lead concentrates, 295 t; zinc concentrates, 348 t; crude ore, 73 t	25.162	573.944	77	223 705	196 361	4 041

Slocan Mining Division —Continued										
Silmonac (Minniehaha)	**Slocan Lake**	Kam-Kotia and Burkam Joint Venture	16 694	Lead concentrates, 1 412 t; zinc concentrates, 1 240 t		7 408.703		836 172	743 490	4 643
Victor	**New Denver**	E. Pederson, New Denver	16	Crude ore	.171	63.699		10 691	358	
White Water	**Retallick**	P. Leonowicz and D. Bialkoski, New Denver	43	Crude ore	.062	54.535		4 846	11 190	
Trail Creek Mining Division										
Blue Bird	**Rossland**	Standonray Mines Ltd.	474	Crude ore	.696	307.772		13 205	15 378	
Midnight	**Rossland**	Sand Mines Ltd.	509	Crude ore	12.939	11.850	425	1 305	583	
Vancouver Mining Division										
Britannia Mine	**Howe Sound**	Anaconda Canada Ltd.	292	Copper precipitate			90 124			
Warman (Northair)	**Callaghan Creek**	Northair Mines Ltd.	47 553	Lead concentrates, 876 t; zinc concentrates, 846 t; dross bars[3]	620.131	3 864.112		340 681	411 021	1 782
Vernon Mining Division										
Chaput	**Lumby**	Saddle Mountain Resources	454	Lead concentrates, 41 t	.156	206.057	654	12 746	5 485	
Kingfisher	**Mabel Lake**	Union Oil Co. of Canada Ltd.	12	Crude ore		.187		830	1 157	
Victoria Mining Division										
Nil										

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[3] Gold and silver bullion recovered from the treatment of base metals.

Table M-1—Metal Production, 1977

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
			t		g	g	kg	kg	kg	kg
Alberni Mining Division										
Lynx and Myra	Buttle Lake	Western Mines Ltd.	269 068	Copper concentrates, 8 670 t; Lead concentrates, 6 466 t; zinc concentrates, 31 247 t	632 075	34 909 727	2 856 881	3 356 196	18 607 822	72 139
Atlin Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Cariboo Mining Division										
Boss Mountain	Big Timothy Mountain	Noranda Mines Ltd. (Boss Mountain Division)	523 453	Molybdenite concentrates, 2 035 t containing 992 588 kg of molybdenum	—	—	—	—	—	—
Gibraltar	McLeese Lake	Gibraltar Mines Ltd.	12 764 959	Copper concentrates, 144 317 t; molybdenite concentrates, 258 t, containing 137 202 kg of molybdenum	—	3 310 292	40 255 709	—	—	—
Clinton Mining Division										
Nil		—	—	—	—	—	—	—	—	—
Fort Steele Mining Division										
Sullivan	Kimberley	Cominco Ltd.	2 194 222	Lead concentrates, 106 264 t; zinc concentrates, 149 339 t; tin concentrates, 426 t containing 181 278 kg of tin	—	89 609 454	—	75 125 898	76 890 967	—
Golden Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Greenwood Mining Division										
Highland Bell	Beaverdell	Teck Corporation Ltd.	33 977	Lead concentrates, 572 t; zinc concentrates, 245 t; jig concentrates, 121 t	5 443	12 030 423	328	122 710	139 565	723
Midway	Midway	David N. Moore, Midway	55	Crude ore	37	10 940	—	—	—	—
Phoenix	Greenwood	Granby Mining Corp., (Phoenix Copper Div.)	832 583	Copper concentrates, 10 226 t	268 238	1 748 891	2 695 517	—	—	—
Kamloops Mining Division										
Afton[1]	Kamloops	Afton Mines Ltd.	122 340	—	—	—	—	—	—	—
Bethlehem	Highland Valley	Bethlehem Copper Corp.	5 554 855	Copper concentrates, 56 531 t	106 652	7 778 580	24 462 130	—	—	—
Lornex	Highland Valley	Lornex Mining Corp. Ltd.	15 480 725	Copper concentrates, 204 448 t; molybdenite concentrates, 3 427 t containing 1 846 840 kg of molybdenum	12 597	19 209 555	66 156 450	—	—	—
Lucky Coon	Adams Plateau	Interpacific Sales Ltd.	496[2]	Lead concentrates, 89 t; zinc concentrates, 77 t	274	228 669	—	62 033	41 367	114
Liard Mining Division										
Nil		—	—	—	—	—	—	—	—	—

Lillooet Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Nanaimo Mining Division										
Island Copper	Rupert Inlet	Utah Mines Ltd.	13 106 006	Copper concentrates, 202 558 t; molybdenite concentrates, 2 302 t containing 987 627 kg of molybdenum; rhenium shipments are confidential	1 496 459	9 699 222	46 749 860	—	—	—
Nelson Mining Division										
HB	Salmo	Cominco Ltd.	357 256	Lead concentrates, 4 813 t; zinc concentrates, 22 606 t	—	996 696	615	1 931 566	12 593 518	95 893
Silver Dollar	Salmo	W. E. Tambling, Squamish	182	Crude ore	1 275	45 193	170	1 577	1 274	—
New Westminster Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Nicola Mining Division										
Craigmont	Merritt	Craigmont Mines Ltd.	1 884 335	Copper concentrates, 63 193 t; iron concentrates, 39 246 t	—	—	17 659 393	—	—	—
Omineca Mining Division										
Bell (Newman)	Babine Lake	Noranda Mines Ltd. (Bell Copper Div.)	4 409 135	Copper concentrates, 59 378 t	714 280	2 066 888	15 890 606	—	—	—
Endako	Endako	Canex Placer Ltd. (Endako Mines Div.)	9 084 501	Molybdenite concentrates, 24 t; molybdic tri-oxide, 12 651 t; ferro-molybdenum, 228 t; total content 7 691 235 kg of molybdenum	—	—	—	—	—	—
Granisle	Babine Lake	Granisle Copper Ltd.	4 474 119	Copper concentrates, 49 724 t	559 761	5 990 904	17 404 635	—	—	—
Silver Standard	Hazelton	George Braun, Hazelton	148	Crude ore	560	236 725	484	11 541	15 681	—
Osoyoos Mining Division										
Brenda	Brenda Lake	Brenda Mines Ltd.	9 634 421	Copper concentrates, 54 837 t; molybdenite concentrates, 6 792 t; molybdic oxide, 15 t; total content 3 866 503 kg of molybdenum	102 080	8 017 576	16 133 570	—	—	—
Horn Silver	Keremeos	Dankoe Mines Ltd.	31 984	Bulk and jig concentrates, 1 168 t	24 260	8 917 790	4 170	23 759	27 993	—
Revelstoke Mining Division										
Nil	—	—	—	—	—	—	—	—	—	—
Similkameen Mining Division										
Similkameen (Ingerbelle)	Princeton	Newmont Mines Ltd. (Similkameen Div.)	7 135 737	Copper concentrates, 74 838 t	969 169	3 980 500	20 596 981	—	—	—

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[1] Commenced production December, 1977.

[2] Estimated.

Table M-1—Metal Production, 1977—Continued

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
			t		g	g	kg	kg	kg	kg
Skeena Mining Division										
Granduc	Stewart	Newmont Mines Ltd. (Granduc Operating Division)	1 252 362	Copper concentrates, 46 575 t	130 011	8 631 953	13 262 755	......	......	......
Premier	Stewart	Nick Benkovich, Stewart	42	Clean-up	1 490	38 091	262	7 629	6 091	......
Tasu	Tasu Sound	Wesfrob Mines Ltd.	1 020 886	Iron concentrates, 384 309 t; copper concentrates, 11 660 t	1 817	80 671	5 080 107	......	......	......
Slocan Mining Division										
Bluebell	Riondell	D. Pearce, Nelson	238	Salvaged lead concentrates, 51 t; zinc concentrates, 187 t	......	39 221	......	18 024	112 717	......
Chief	Mt. Ruppel	N. Block, Nelson	3	Crude ore	9	7 167	......	121	8	......
Enterprise	Enterprise Creek	T. Mazur, Calgary	89	Crude ore	21	64 228	54	2 225	3 025	......
Galena Farm	Silverton	Selmon Resources Ltd.	33	Clean-up; lead concentrates, 9 t; zinc concentrates, 24 t	47	117 445	......	6 216	13 025	94
Lucky Thought	Silverton	S. Berisoff, Silverton	327	Crude ore	......	329 630	144	25 407	28 819	191
Moose	Silverton	D. Pengelly, Silverton	45	Crude ore	......	143 229	......	24 053	4 982	......
Ottawa	Springer Creek	C. Thickett, Slocan	1 304	Silver concentrates, 8 t; crude ore, 112 t	33	1 325 579	196	557	344	......
Scranton	Kaslo	Star Syndicate and Hem Mines Ltd.	6 869	Lead concentrates, 259 t; zinc concentrates, 287 t	29 019	468 660	35	182 843	171 209	3 740
Silmonac (Minniehaha)	Slocan Lake	Silvana Mines Ltd. (formerly Kam-Kotia-Burkam Joint Venture)	15 996	Lead concentrates, 1 873 t; zinc concentrates, 1 041 t	......	9 163 815	......	1 102 548	712 759	3 995
Victor (Violamac)	New Denver	E. Pederson, New Denver	15	Crude ore	311	57 136	34	92	298	......
Whitewater	Retallick	P. Leontowicz and L. Fried, New Denver	11	Crude ore	......	15 552	45	1 831	3 069	......
Trail Creek Mining Division										
Bluebird	Rossland	Standonray Mines Ltd.	2 081	Crude ore	1 454	586 758	......	29 709	35 135	......
I.X.L.	Rossland	J. A. Ruelle and L. G. McLellan	43	High-grade ore	1 584	1 664	51	127	42	......
Vancouver Mining Division										
Astra—Cambria, Blue Jack	Alta Lake	Van Silver Mines Ltd.	8 067	Silver concentrates, 97 t	1 381	157 468	1 290	6 764	9 857	......
Britannia	Howe Sound	Anaconda Canada Ltd. and D. Pearce, Nelson	236	Copper precipitate clean-up	—	7 465	56 555	......	......	......
Warman (Northair)	Callaghan Creek	Northair Mines Ltd.	84 366	Lead concentrates, 2 489 t; zinc concentrates 2 347 t; dore bars	1 234 043	10 341 094	......	1 217 824	1 265 112	1 354
Vernon Mining Division										
Nil			......		......	......	......	......	......	......
Victoria Mining Division										
Nil			......		......	......	......	......	......	......

Table M-1—Metal Production, 1978

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
Alberni Mining Division										
Lynx and Myra	Buttle Lake	Western Mines Ltd.	269 033	Copper concentrates, 11 485 t; lead concentrates, 6 463 t; zinc concentrates, 32 400 t	628 094	36 150 053	3 294 888	2 768 914	18 003 921	71 704
Atlin Mining Division										
Nil										
Cariboo Mining Division										
Boss Mountain	Big Timothy Mountain	Noranda Mines Ltd. (Boss Mountain Div.)	541 928	Molybdenite concentrates, 1 384 t containing 764 516 kg of molybdenum						
Gibraltar	McLeese Lake	Gibraltar Mines Ltd.	5 135 655	Copper concentrates, 74 705 t; molybdenite concentrates, 238 t containing 119 174 kg of molybdenum		3 265 628	19 713 622			
Clinton Mining Division										
Nil										
Fort Steele Mining Division										
Sullivan	Kimberley	Cominco Ltd.	2 107 869	Lead concentrates, 134 270 t; zinc concentrates, 119 716 t; tin concentrates, 561 t containing 236 339 kg of tin		114 039 181		88 863 212	64 417 720	
Golden Mining Division										
Ruth Vermont	Spillimacheen	Ruth Vermont Mines Ltd.	62	Clean-up; lead concentrates, 20 t; zinc concentrates, 42 t		75 083	384	13 600	21 901	166
Greenwood Mining Division										
Highland Bell	Beaverdell	Teck Corporation Ltd.	35 280	Lead concentrates, 439 t; zinc concentrates, 403 t; jig concentrates, 121 t	4 012	11 333 062	865	105 933	139 279	977
Phoenix	Greenwood	Granby Mining Corp. (Phoenix Copper Div.)	237 801	Copper concentrates, 2 645 t	120 555	924 599	912 728			
Kamloops Mining Division										
Afton	Kamloops	Afton Mines Ltd.	2 456 757	Copper concentrates, 18 176 t; blister copper, 5 995 t	1 022 791	5 524 701	15 429 468			
Bethlehem	Highland Valley	Bethlehem Copper Corp.	6 490 726	Copper concentrates, 41 580 t; molybdenite concentrates, 269 t containing 133 777 kg of molybdenum	124 661	7 299 470	18 312 007			
Lornex	Highland Valley	Lornex Mining Corp. Ltd.	15 927 064	Copper concentrates, 208 799 t; molybdenite concentrates, 3 459 t containing 1 864 355 kg of molybdenum		17 486 200	63 114 028			

Table M-1—Metal Production, 1978—Continued

Property or Mine	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
			t		g	g	kg	kg	kg	kg
Liard Mining Division										
Nil										
Lillooet Mining Division										
Bralorne	Bridge River	Nelson Machinery Co. Ltd.	149	Clean-up	14 992	4 976		150	150	
Nanaimo Mining Division										
Island Copper	Rupert Inlet	Utah Mines Ltd.	14 200 203	Copper concentrates, 218 515 t; molybdenite concentrates, 2 087 t containing 859 104 kg of molybdenum; rhenium shipments are confidential	1 345 360	10 402 740	50 653 152			
Nelson Mining Division										
HB	Salmo	Cominco Ltd.	200 888	Lead concentrates, 3 900 t; zinc concentrates, 15 264 t		827 713		1 451 180	8 381 566	67 298
New Westminster Mining Division										
Nil										
Nicola Mining Division										
Craigmont	Merritt	Craigmont Mines Ltd.	1 899 934	Copper concentrates, 93 082 t; iron concentrates, 33 183 t; coarse iron, 2 513 t			26 290 618			
Omineca Mining Division										
Bell (Newman)	Babine Lake	Noranda Mines Ltd. (Bell Copper Div.)	4 470 070	Copper concentrates, 64 464 t	763 299	2 210 148	17 144 917			
Endako	Endako	Placer Development Ltd. (Endako Mines Div.)	10 656 643	Molybdic tri-oxide, 10 176 t; ferromolybdenum, 200 t; total content, 6 030 967 kg of molybdenum						
Golden Eagle	Topley	V. G. Finch and R. Williams, Smithers	3	Crude ore	9	10 404		317	140	
Granisle	Babine Lake	Granisle Copper Ltd.	4 549 265	Copper concentrates, 47 366 t	467 571	4 819 410	14 851 373			
Silver Standard	Hazelton	George Braun, Hazelton	57	Crude ore	187	78 286	138	2 811	4 016	
Sunrise Silver	Hazelton	M. Kryger, Smithers	26	Crude ore		19 377		1 642	2 356	
Osoyoos Mining Division										
Brenda	Brenda Lake	Brenda Mines Ltd.	9 995 736	Copper concentrates, 46 880 t; molybdenite concentrates, 5 820 t containing 3 310 663 kg of molybdenum	111 629	7 140 191	14 072 630			
Horn Silver	Keremeos	Dankoe Mines Ltd.	28 677	Bulk concentrates, 979 t; jig concentrates, 97 t	23 949	7 569 195	5 518	21 091	27 927	
Revelstoke Mining Division										
Nil										

Similkameen Mining Division										
Similkameen (Ingerbelle)	Princeton	Newmont Mines Ltd. (Similkameen Div.)	6 779 045	Copper concentrates, 88 964 t	1 152 926	4 347 297	24 725 222	…	…	…
Skeena Mining Division										
Granduc	Stewart	Newmont Mines Ltd. (Granduc Operating Div.)	741 648	Copper concentrates, 52 268 t	160 460	9 056 914	14 780 100	…	…	…
Premier	Stewart	Spring Investments Ltd.	245	Clean-up; lead concentrates, 58 t; ore, 187 t	9 144	312 212	98	17 915	15 035	…
Tasu	Tasu Sound	Wesfrob Mines Ltd.	889 933	Iron concentrates, 554 414 t; copper concentrates, 5 989 t	28 397	1 198 647	1 175 609	…	…	…
Troy	Stewart	Nick Benkovich, Stewart	22	Crude ore	370	5 038	…	420	641	…
Slocan Mining Division										
Arlington	Slocan	R. S. Reilly and D. P. Bialkoski, Slocan, and Selmon Resources Ltd.	17	Lead concentrates, 17 t; dump clean-up	…	84 569	…	5 946	3 647	…
Colonial	Sandon	N. Sibilleau, North Surrey	2	Crude ore	…	8 802	…	1 895	82	…
Corinth	Sandon	Corinthian Mines Ltd.	7	Crude ore	…	1 680	…	443	1 350	…
Grey Copper (Blue Bird)	Cody	G. Sipos, Kaslo	19	Crude ore	…	6 096	…	671	4 993	…
Little Tim	Slocan City	D. Nebor, Slocan	54	Lead concentrates, 2 t	…	54 710	…	646	386	…
Mammoth	Silverton	D. Pengelly, Silverton	15	Lead concentrates, 5 t; zinc concentrates, 10 t	…	16 982	…	3 784	5 279	…
Ottawa	Springer Creek	C. Thickett, Slocan	496	Silver concentrates, 7 t; crude ore, 42 t	…	1 372 047	234	647	335	…
Pilot Bay	Pilot Bay	D. Pearce, Nelson	8	Smelter clean-up; lead concentrates, 2 t; zinc concentrates, 6 t	…	1 275	…	527	3 746	…
Queen Bess (Idaho)	Sandon	I. T. Steenhoff, New Denver	8	Crude ore	10	43 389	…	6 284	135	…
Scranton	Kaslo	Hem Mines Ltd.	114	Lead concentrates, 56 t; zinc concentrates, 58 t	5 381	109 669	…	41 112	32 651	681
Silmonac (Minniehaha)	Slocan Lake	Silvana Mines Ltd.	15 967	Lead concentrates, 1 460 t; zinc concentrates, 972 t	…	7 579 024	…	883 758	638 881	3 724
Trail Creek Mining Division										
Bluebird	Rossland	Standonray Mines Ltd.	130	Lead concentrates, 54 t; zinc concentrates, 76 t	560	280 860	…	13 755	29 385	…
Golden Drip	Rossland	J. A. Ruelle and L. G. McLellan, Rossland	16	Crude ore	1 711	1 213	…	34	17	…
Vancouver Mining Division										
Warman (Northair)	Callaghan Creek	Northair Mines Ltd.	93 397	Lead concentrates, 2 782 t; zinc concentrates, 2 161 t; dore bars	1 069 386	5 708 023	100 930	1 140 032	1 464 364	…
Vernon Mining Division										
Silver Bell	Cherry Creek	Cheyenne Mines Ltd.	14	Crude ore	311	43 171	…	700	252	…
Victoria Mining Division										
Sunro	Jordan River	Dison International Ltd.	(1)	Copper concentrates, 9 t	31	435	2 143			…

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[1] Disposal of stockpile.

Table M-1—Metal Production, 1979

Property or Mine (and Location of Mine)	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
				Gold	Silver	Copper	Lead	Zinc	Cadmium
		t		g	g	kg	kg	kg	kg
Alberni Mining Division									
Lynx and Myra (Buttle Lake)	Western Mines Ltd.	266 877	Copper concentrates, 12 284 t; lead concentrates, 7 178 t; zinc concentrates, 34 069 t	802 688	37 990 999	3 595 016	3 137 575	18 933 570	79 887
Atlin Mining Division									
Nil	......	......	......	......	......	......	......	......	......
Cariboo Mining Division									
Boss Mountain (Big Timothy Mountain)	Noranda Mines Ltd. (Boss Mountain Division)	496 108	Molybdenite concentrates, 1 094 t containing 614 961 kg of molybdenum	......	......	......	......	......	......
Gibraltar (McLeese Lake)	Gibraltar Mines Ltd.	10 446 035	Copper concentrates, 115 388 t; molybdenite concentrates, 752 t; molybdic trioxide, 25 t containing 408 676 kg of molybdenum	......	3 373 452	32 217 953	......	......	......
Clinton Mining Division									
Nil	......	......	......	......	......	......	......	......	......
Fort Steele Mining Division									
Shado (St. Mary River)	Shado Mines Ltd.	3	Crude ore	......	1 352	......	756	143	......
Sullivan (Kimberley)	Cominco Ltd.	2 047 726	Lead concentrates, 142 223 t; zinc concentrates, 130 512 t; tin concentrates, 549 t containing 207 095 kg of tin	......	107 342 730	......	92 146 668	70 745 854	......
Golden Mining Division									
Ruth Vermont (Spillimacheen)	Ruth Vermont Mines Ltd.	36	Clean-up; lead concentrates, 34 t; zinc concentrates, 2 t	26	20 964	......	3 981	5 459	......
Greenwood Mining Division									
B A S (Rock Creek)	R. W. Yorke-Hardy, Revelstoke	1	Crude ore	22	7 029	......	83	77	......
Highland Bell (Beaverdell)	Teck Corporation	33 664	Lead concentrates, 388 t; zinc concentrates, 399 t; jig concentrates, 97 t	4 199	10 259 637	613	93 324	140 679	1 000
Midway, Number Seven (Boundary Falls)	David Moore, Midway	36	Crude ore	105	8 253	......	......	......	......
Riverside (Rock Creek)	Baykem Enterprises Ltd.	85	Crude ore	93	16 889	......	460	591	......

Kamloops Mining Division									
Afton (Kamloops)	Afton Mines Ltd.	2 822 850	Copper concentrates, 10 249 t; blister copper, 19 827 t	1 860 022	9 365 673	25 611 766	......	......	......
Bethlehem (Highland Valley)	Bethlehem Copper Corp.	6 525 449	Copper concentrates, 51 339 t; molybdenite concentrates, 592 t containing 306 286 kg of molybdenum	122 797	6 535 338	21 260 613	......	......	......
Lornex (Highland Valley)	Lornex Mining Corp Ltd	16 126 103	Copper concentrates, 194 829 t; molybdenite concentrates, 3 818 t containing 2 059 851 kg of molybdenum	......	16 562 009	60 858 558	......	......	......
Mosquito King (Adams Plateau)	Orell Copper Mines Ltd.	147	Crude ore	218	35 645	......	14 804	12 256	......
Liard Mining Division									
Erickson (McDame Lake)	Erickson Gold Mining Corp.	28 896	Gold concentrates, 401 t	574 668	567 763	......	......	......	......
Lillooet Mining Division									
Nil	......	......	......	......	......	......	......	......	......
Nanaimo Mining Division									
Island Copper (Rupert Inlet)	Utah Mines Ltd.	13 339 997	Copper concentrates, 218 490 t; molybdenite concentrates, 2 705 t containing i 111 400 kg of molybdenum; rhenium shipments are confidential	1 684 627	10 994 861	50 254 743	......	......	......
Nelson Mining Division									
Big John (Salmo)	R. Spinks and T. Brown, Salmo	44	Crude ore	......	4 417	......	2 219	3 438	......
Gold Belt (Salmo)	Goldbelt Mines Ltd.	1 010	Crude ore	9 860	21 275	681	7 564	3 927	......
Keystone (Salmo)	R. G. Taylor, Montrose	40	Crude ore	1 337	5 319	54	1 459	1 072	......
Reno (Salmo)	Nugget Mines Ltd	64	Crude ore	554	......	......	......	......	......
New Westminster Mining Division									
R N (Harrison Lake)	R. J. Dealy, Vancouver	37	Crude ore	1 147	......	......	......	......	......
Nicola Mining Division									
Craigmont (Merritt)	Craigmont Mines Ltd	1 924 570	Copper concentrates, 56 631 t; iron concentrates, 41 372 t; coarse iron, 3 156 t	......	......	16 188 137	......	......	......
Stump Lake (Nicola)	El Klondike Mines Ltd	9	Crude ore	111	3 473	......	239	168	......

Table M-1—Metal Production, 1979—Continued

Property or Mine (and Location of Mine)	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
				Gold	Silver	Copper	Lead	Zinc	Cadmium
Omineca Mining Division		t		g	g	kg	kg	kg	kg
Bell (Newman), (Babine Lake)	Noranda Mines Ltd. (Babine Div. — Bell mine)	5 073 909	Copper concentrates, 48 456 t	656 601	1 661 368	13 136 524			......
Endako (Endako)	Placer Development Ltd. (Endako Mines Div.)	4 768 000	Molybdenite concentrates, 12 t; molybdic trioxide, 6 205 t; ferromolybdenum, 104 t; total content, 3 738 530 kg of molybdenum	......	......	......	......	......	......
Granisle (Babine Lake)	Zapata Granby Corp. and Noranda Mines Ltd. (Babine Div.—Granisle Mine)	4 382 882	Copper concentrates, 50 205 t	497 624	5 338 725	17 326 860	......	......	......
Sil-Van (Smithers)	P. Kindrat, Smithers	94	Crude ore	118	344 693	......	8 008	9 279	......
Silver Standard (Hazelton)	G. Braun, New Hazelton	93	Crude ore	233	114 243	......	5 348	5 627	......
Sunrise Silver (Hazelton)	Kryco Mines Ltd.	181	Silver concentrates, 15 t	......	22 985	......	2 790	2 374	......
Osoyoos Mining Division									
Brenda (Brenda Lake)	Brenda Mines Ltd.	9 075 723	Copper concentrates, 36 672 t; molybdenite concentrates, 4 496 t containing 2 536 130 kg of molybdenum	101 289	5 727 844	10 626 562	......	......	......
Horn Silver (Keremeos)	Dankoe Mines Ltd.	25 536	Bulk concentrates, 872 t; jig concentrates, 132 t	18 755	6 084 338	4 789	17 244	24 299	......
Revelstoke Mining Division									
Independence (Revelstoke)	R. Bacon, Kamloops	31	Crude ore	156	373	......	31	31	......
Similkameen Mining Division									
Similkameen (Ingerbelle), (Princeton)	Newmont Mines Ltd. (Similkameen Div.)	6 898 844	Copper concentrates, 94 297 t	1 185 509	4 316 292	26 506 197	......	......	......
Skeena Mining Division									
Blue Grouse (Glacier Creek)	J. Lehto, Stewart	6	Crude ore	26	16 360	36	1 104	1 325	......
Goat Ridge (Stewart)	Nor-Quest Resources Ltd.	124	Crude ore	1 110	540 401	......	726	9 789	......
Premier (Stewart)	Spring Investments Ltd.	105	Clean-up; lead concentrates, 36 t; ore, 69 t	2 242	13 122	445	9 937	8 146	......
Tasu (Tasu Sound)	Westfrob Mines Ltd.	1 009 247	Iron concentrates, 589 642 t; copper concentrates, 18 739 t	92 159	3 529 716	3 861 563	......	......	......
Troy (Stewart)	N. Benkovich, Stewart	33	Crude ore	505	16 588		870	1 004	......

Slocan Mining Division									
Arlington (Slocan)	Edward Shukin, Slocan	1 037	Lead concentrates, 32 t; zinc concentrates, 17 t	588	117 300	53	15 724	12 967	46
Colonial (Sandon)	N. Sibilleau, North Surrey	3	Crude ore	......	5 163	......	1 482	128	......
Emerald Hill (Ainsworth)	J. A. Jardine, Kaslo	2	Crude ore	......	11 757	......	463	44	......
Fourth of July (Retallack)	Tri County Holdings Ltd.	2	Crude ore	......	2 364	......	470	117	......
Gladstone (New Denver)	W. Turley, Kaslo	4	Crude ore	......	9 424	......	576	721	......
Grey Copper (Blue Bird), (Cody)	G. H. Cook, Calgary, and G. Sipos, Kaslo	684	Lead concentrates, 2 t; zinc concentrates, 27 t; ore, 7 t	......	39 167	......	3 099	15 241	114
H J (Nakusp)	F. D. Jordans, Nakusp	11	Crude ore	......	622	......	10	10	......
J R T (Duncan Lake)	J. O. Elmer, Vernon	4	Crude ore	2	4 354	18	2 059	38	......
Lakeview (Slocan)	Selmon Resources Ltd	426	Lead concentrates, 4 t; zinc concentrates, 8 t	11	51 570	......	1 593	3 612	24
Millie Mack (Burton)	W. D. Smith and S. G. Ramer, Kelowna	73	Crude ore	529	21 088	32	905	626	......
Molly Hughes (New Denver)	Denver Silver Inc.	3	Crude ore	5	1 768	2	26	12	......
Morning Star (Slocan)	L. C. Dekock, Slocan	19	Crude ore	......	404	......	39	20	......
Au (Silverton)	Syber Mines Ltd.	562	Lead concentrates, 7 t; zinc concentrates, 34 t; ore, 18 t	24	82 825	143	5 868	17 094	123
Ottawa, Memphis (Springer Creek)	Memphis Mines Ltd.	69	Crude ore	......	673 764	......	......	......	......
Panama (New Denver)	United Hearne Resources Ltd	850	Crude ore	342	757 121	......	4 196	......	......
Scranton (Kaslo)	David Minerals Ltd.	3 120	Lead concentrates, 53 t; zinc concentrates, 259 t	3 348	117 670	1 012	37 256	131 535	1 563
Pilot Bay (Pilot Bay)	D. Pearce, Nelson	208	Clean-up	31	73 746	......	824	2 100	......
Silmonac (Minniehaha), (Slocan Lake)	Silvana Mines Ltd.	19 625	Lead concentrates, 1 500 t; zinc concentrates, 1 323 t	......	9 021 470	......	912 566	813 375	4 961
Silver Maiden (Silverton)	R. F. Mills, Silverton	39	Crude ore	......	27 651	......	659	4 458	......
Spokane (Slocan)	W. Turley, Kaslo	183	Lead concentrates, 3 t; zinc concentrates, 16 t; ore, 8 t	......	98 522	......	3 025	11 716	75
Victor (Sandon)	E. Petersen, New Denver	10	Crude ore	175	43 370	......	6 016	137	......
Wonderful (Sandon)	G. Sipos, Kaslo	120	Lead concentrates, 4 t; zinc concentrates, 8 t	......	20 218	......	1 645	3 772	......
Trail Creek Mining Division									
Midnight (Rossland)	Carnelian Mines Ltd.	42	Crude ore	5 319	3 764	183	144	42	......
Vancouver Mining Division									
Warman (Northair) (Callaghan Creek)	Northair Mines Ltd.	88 309	Lead concentrates, 1 712 t; zinc concentrates, 1 587 t; dore bars	954 534	1 926 052	94 186	724 866	1 106 137	......
Vernon Mining Division									
Nil	......	......	......	......	......	......	......	......	......
Victoria Mining Division									
Nil	......	......	......	......	......	......	......	......	......

Table M-1—Metal Production, 1980

Property of Mine (and Location of Mine)	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
				Gold	Silver	Copper	Lead	Zinc	Cadmium
		t		g	g	kg	kg	kg	kg
Alberni Mining Division									
Lynx and Myra (Buttle Lake)	**Western Mines Ltd.**	278 244	Lead concentrates 3 738 t; zinc concentrates 32 642 t; copper concentrates 6 997 t.	444 126	20 453 988	1 880 636	1 568 857	17 918 936	76 262
Atlin Mining Division									
Nil									
Cariboo Mining Division									
Mosquito Creek (Wells)	**Mosquito Creek Gold Mining Co. Ltd.**	11 419	Gold Bullion	136 869	36 885				
Boss Mountain (Takomkane Mountain)	**Noranda Mines Ltd. (Boss Mountain Div.)**	533 254	Molybdenite concentrates 1 523 t containing 769 806 kg of molybdenum.						
Gibraltar (McLeese Lake)	**Gibraltar Mines Ltd.**	12 644 000	Copper concentrates 119 325 t; molybdenite concentrates 17 t; molybdic oxide 987 t containing 528 461 kg of molybdenum.		4 639 395	32 672 960			
Park (Barkerville)	**Chaput Logging**	172	Crude ore	721	243 385	1 072	10 386	3 956	
Clinton Mining Division									
Nil									
Fort Steele Mining Division									
Sullivan (Kimberley)	**Cominco Ltd.**	2 132 416	Lead concentrates, 115 714 t; zinc concentrates 94 518 t; tin concentrates 335 t containing 113 056 kg of tin.		86 394 417		76 095 523	51 804 218	
Golden Mining Division									
Nil									
Greenwood Mining Division									
Gem (Greenwood)	**Kenar Resources**	40	Crude ore	92	4 728	44	681	160	
Highland Bell (Beaverdell)	**Teck Corporation**	39 457	Lead concentrates 333 t; zinc concentrates 386 t; jig concentrates 98 t.	3 359	10 757 821	389	93 278	145 325	1 080
Riverside (Rock Creek)	**Baykem Enterprises Ltd.**	8	Crude ore	61	303		17	2	
Kamloops Mining Division									
Afton (Kamloops)	**Afton Mines Ltd.**	2 739 799	Copper concentrates 5 058 t; blister copper 22 510 t.	1 431 195	8 859 577	24 221 282			
Bethlehem (Highland Valley)	**Bethlehem Copper Corp.**	6 281 765	Copper concentrates 75 512 t, molybdenite concentrates 173 t containing 93 299 kg of molybdenum	129 204	6 503 270	22 715 445			
OK, Alwin (Highland Valley)	**Dekalb Mining Corp.**	48 223	Shipments commenced in 1981.						
Lornex (Highland Valley)	**Lornex Mining Corp. Ltd.**	16 037 591	Copper concentrates, 203 271 t; molybdenum concentrates, 2 903 t; molybdic oxide, 1 118 t; ferro-molybdenum, 83 t containing 2 168 136 kg of molybdenum		18 372 886	63 431 872			

Liard Mining Division									
Erickson (McDame Lake)	Erickson Gold Mining Corp.	28 804	Gold concentrates 561 t	484 662					
Lake (Tootsee River)	T. Ribe, Vancouver	1	Crude ore		280		48	37	
Lillooet Mining Division									
Bralorne (Bralorne)	Nelson Machinery Co. Ltd.	6	Clean-up	404	124		7	7	
Nanaimo Mining Division									
Island Copper (Rupert Inlet)	Utah Mines Ltd.	13 782 249	Copper concentrates 219 405 t; molybdenite concentrates 2 703 t containing 1 113 074 kg of molybdenum.	1 747 704	13 456 484	50 033 433			
Nelson Mining Division									
Bee Gee (Nelson)	William Grant, Nelson	13	Crude ore		3 421		66	675	
Goldridge (Clearwater)	G. and R. Longset, Trail	46	Crude ore	184	2 578		326	116	
Keystone (Salmo)	Silver Key Mining Corp.	195	Crude ore	3 266	11 508	123	2 957	2 177	
Motherlode (Sheep Creek)	Nugget Mines Ltd.	435	Crude ore	4 429	7 123		696	1 028	
Nugget (Sheep Creek)	Nugget Mines Ltd.	425	Crude ore	4 264	2 877		469	435	
Rachel (Nelson)	Kimberley Gold Mines	14	Crude ore	946	3 851		1 335		
New Westminster Mining Division									
Nil									
Nicola Mining Division									
Craigmont (Merritt)	Craigmont Mines Ltd.	1 950 551	Copper concentrates 38 649 t; iron concentrates 41 562 t; coarse iron 2 649 t.	13 312		10 794 185			
El Klondike (Nicola)	G. Irving, Kamloops	10	Crude ore	62	4 541		162	152	
Omineca Mining Division									
Bell (Babine Lake)	Noranda Mines Ltd. (Babine Div.)	5 011 943	Copper concentrates 65 901 t	848 347	2 259 450	17 532 042			
Dome (Hazelton)	George Braun, New Hazelton	518	Crude ore	1 586	1 004 580	1 236	29 683	32 026	
Endako (Endako)	Placer Development Ltd. (Endako Mines Div.)	11 103 147	Molybdenum concentrates 376 t; molybdic trioxide 7 284 t; ferro-molybdenum 163 t; total content 4 651 559 kg of molybdenum.						
Golden Eagle (Topley)	Gordon Finch, Smithers	31	Crude ore		17 262		648	48	
Granisle (Babine Lake)	Noranda Mines Ltd. (Babine Div.)	3 936 725	Copper concentrates 39 869 t	387 083	4 075 675	13 258 799			
Sunrise (Nine Mile Mountain)	M. Kryger, Smithers	191	Crude ore	6 656	31 850	229	3 376	4 030	

Table M-1—Metal Production, 1980—Continued

Property of Mine (and Location of Mine)	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
				Gold	Silver	Copper	Lead	Zinc	Cadmium
		t		g	g	kg	kg	kg	kg
Osoyoos Mining Division									
Brenda (Brenda Lake)	Brenda Mines Ltd	9 126 860	Copper concentrates 32 390 t, molybdenite concentrates 3 330 t containing 1 855 166 kg of molybdenum	77 494	4 816 579	9 152 418			
Horn Silver (Keremeos)	Dankoe Mines Ltd	19 634	Bulk concentrates 678 t	7 981	2 936 329		9 275	15 273	
Revelstoke Mining Division									
Baldon Bush (Tangier River)	G. L. Benwell, Revelstoke	6	Crude ore		15 769		3 897	356	
Canadian (Revelstoke)	C.T. Explorations Ltd	67	Crude ore	230	6 812		1 485	1 282	
Similkameen Mining Division									
Similkameen (Ingerbelle) (Princeton	Newmont Mines Ltd. (Similkameen Div.)	6 612 035	Copper concentrates 90 871 t	1 168 495	4 860 882	26 258 573			
Skeena Mining Division									
Goat Ridge (Stewart)	Nor-Quest Resources Ltd	1 865	Silver concentrates 30 t; crude ore 1 462 t	3 412	945 075	153	3 278	32 397	
Monroe (Stewart)	W. Rodway, Stewart	6	Crude ore	32	2 229			79	
Tasu (Tasu Sound)	Falconbridge Nickel Mines Ltd. (Wesfrob Mines Div.)	996 422	Iron concentrates 581 637 t; copper concentrates 10 689 t	51 694	2 206 506	2 225 590			
Slocan Mining Division									
Blue Bird (Sandon)	Alsi Holdings	11	Crude ore		13 958		1 803	612	
Capello (New Denver)	Emu Enterprises	4	Crude ore		4 199		34	67	
Hall (Sandon)	Hallmac Mines Ltd	41	Crude ore	28	180 618		30 109	414	
Hecla (Silverton)	Mills and Mengler, Silverton	489	Crude ore	228	570 065	390	29 784	41 665	
Lakeview (Springer Creek)	Selmon Resources Ltd	3	Crude ore		50 294		2 706	290	
McAllister (New Denver)	Ralph Sostad, West Vancouver	523	Crude ore	52	145 004		2 501	1 788	
Mercury (New Denver)	P. McCrory, New Denver	18	Crude ore		5 381		668	1 186	
Mesmer (Slocan)	N. Storgard, Slocan	33	Crude ore	142	15 552		33	33	
Molly Hughes (New Denver)	Monte Lloyd, New Denver	11	Crude ore		1 835		264	1 167	
Monarch (Silverton)	Kegorhe Mines Ltd	46	Crude ore	22	83 196	46	6 465	2 022	
Noonday (Slocan)	Dennis Tyres, Kaslo	5	Crude ore		5 474		359	441	
Nor 1 and " (Lendrum Creek)	Ron Davidson, Ainsworth	14	Crude ore	3	4 248		64	107	
Ottawa (Springer Creek)	Memphis Mines Ltd	596	Crude ore		994 689				
Panama (New Denver)	United Hearne Resources	826	Crude ore	409	904 800	809	2 889	621	
Pilot Bay (Pilot Bay)	D. Pearce, Nelson		Clean-up	317	530 314		5 820	13 194	
Pack (New Denver)	C. G. Pownall, New Denver	90	Crude ore	31	16 765		181	181	
Rich-Mitch (Slocan Lake)	David Groenhuysen	10	Crude ore		7 434		7 357	2 422	

Silmonac (Minnehaha) (Slocan Lake)	Dickenson Mines Ltd	29 820	Lead concentrates 1 362 t; zinc concentrates 1 223 t		7 687 934		791 327	726 989	4 410
Snowstorm (Slocan)	T. Eccles, Rossland	1	Crude ore		1 285		502	158	
Spokane (Slocan)	Arley Mines Ltd	463	Crude ore		203 697		10 128	27 354	
Utica (12 Mile Creek)	David Minerals Ltd	9 525	Lead concentrates 403 t; zinc concentrates 150 t, crude ore 12 t.	804	1 056 989		28 755	141 958	577
Westmont (Silverton)	Hoko Exploration Ltd	481	Lead concentrates 6 t, zinc concentrates 5 t, ore 34 t	36	89 827	54	2 389	4 956	17
Whitewater (Retallack)	Woodcrest Holdings Ltd	18	Crude ore	218	373		18	35	
Trail Creek Mining Division									
Golden Drip (Rossland)	Lloyd McLellan, Rossland	23	Crude ore	2 657	1 564		93	24	
Vancouver Mining Division									
Warman (Northair) (Callaghan Creek)	Northair Mines Ltd	71 124	Lead concentrates 1 779 t, zinc concentrates 2 246 t, dore bars	564 131	1 894 138	97 203	871 219	1 246 617	
Vernon Mining Division									
Black Beard (Silver Bell) (Lumby)	Black Beard Mine Inc	16	Crude ore	31	1 337		49	33	
Zumar (Kelowna)	Zumar Resources	55	Crude ore	261	2 324		55	55	
Victoria Mining Division									
Nil									

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Province of
British Columbia
Ministry of
Energy, Mines and
Petroleum Resources

Mining
in British Columbia

Volume II

Report of the
Chief Inspector

—

1975
—
1980

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Mining in British Columbia

Volume II

Report of the Chief Inspector

Province of
British Columbia
Ministry of
Energy, Mines and
Petroleum Resources

1975

—

1980

MINING IN BRITISH COLUMBIA (1975–1980)

FOREWORD

A continuing and relatively complete summary of mining activity was published as the Annual Report of the Minister of Mines, starting in 1874. A change in the form of presentation occurred, with a separation into two publications, in 1969. Much material was not made available in any form after 1974, and the record was consequently broken after 100 years. It is the intent of the present two-volume publication to repair this discontinuity, in order that the published record of activities at producing mines of all sorts is complete to the end of 1980.

The hiatus in the publishing of data was the result of changes in departmental functions and lack of appropriate personnel. The expanded Department, now the Ministry, is still in process of adopting a uniform series of annual publications once covered by a single volume.

In order that the reader who is intent on filling in the gaps in the record, once provided by a single annual report, may understand the development of events, a brief statement of the evolution of publications follows. The changes were in part brought about by the fact that the single volume had become too large and unwieldy.

An Annual Report of the Minister of Mines was published from 1874 to 1959, after which it was the Annual Report of the Minister of Mines and Petroleum Resources until 1979, when it became the Annual Report of the Ministry of Energy, Mines and Petroleum Resources.

The Annual Report of the Minister contained virtually all data and reportage of the mining industry from 1874 to 1968. In that span of time all statistics relating to metals, industrial minerals, placer gold, and coal; all descriptions of mines and mining activity; and a full report of the Chief Inspector of Mines were together in one annual volume.

In 1969, descriptive material was published separately in a single volume, referred to as Geology, Exploration and Mining in British Columbia (GEM). Descriptions of mines and production activity were eliminated in 1975, and Geology, Exploration and Mining was broken down into separate publications.

The annual report of the Chief Inspector of Mines was published in full until 1974. In succeeding years the report was drastically reduced in scope, with deletion of descriptions of fatal accidents and dangerous occurrences, certifications, etc.

The two-volume report, Mining in British Columbia (1975–1980), is written to ensure that an unbroken published record of Ministry activity exists from 1874 to the end of 1980, in Annual Report of the Minister, in Geology, Exploration and Mining (GEM), and in the present report.

Volume I—Mine Production presents the location, a summary of activity, a brief description, and production statistics for essentially all active mines or properties in British Columbia that produced metals, non-metals, or coal in the period 1975–80.

Volume II—Report of the Chief Inspector presents the full activities of mines inspection, accidents, and safety practices in all types of mining. It provides an account of the work of the Inspection and Engineering Branch relating to all phases of mineral production, exclusive of conservation and reclamation.

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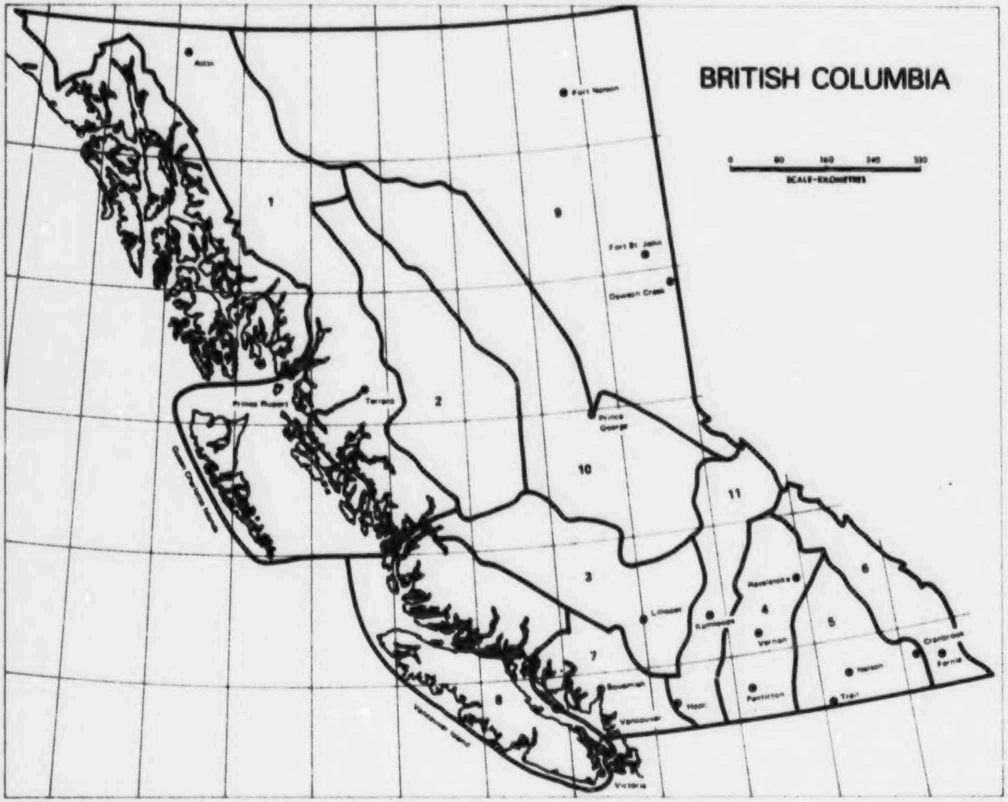
1. Index map showing inspectoral districts vi

INTRODUCTION

Volume II of Mining in British Columbia (1975–1980) outlines the activities of the Inspection and Engineering Branch of the Mineral Resources Division and summarizes the dangerous occurrences and fatal accidents that occurred during this six-year period. Lists of mine rescue certificates and shiftboss certificates are not included.

The reports of the fatal accidents and dangerous occurrences, which make up the bulk of this volume, have been released previously, in the form of summaries which were printed and circulated periodically during the year in which they occurred.


BRITISH COLUMBIA
0
80
160
240
320
SCALE-KILOMETRES
Atlin
Fort Nelson
Fort St. John
Dawson Creek
Prince Rupert
Terrace
Prince George
Queen Charlotte Islands
Lillooet
Kamloops
Revelstoke
Vernon
Penticton
Hope
Squamish
Vancouver
Victoria
Vancouver Island
Nelson
Trail
Cranbrook
Fernie
1
2
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8
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11

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Figure 1. Index map showing inspectoral districts.

STAFF AND STAFF CHANGES

Except for the senior staff in Victoria, the Inspectors examine coal mines, metal mines, and quarries in the districts as indicated on Figure 1. They also may examine prospects, mining properties, roads and trails, and carry out special investigations under the *Mineral Act*. The Environmental Control Inspectors conduct dust, ventilation, and noise surveys at all mines and quarries and radiation inspections as required. Where necessary, they make recommendations to improve environmental conditions. The Senior Inspector, Mining Roads, supervises the roads and trails program. The Senior Inspector, Reclamation, administers the reclamation sections of the *Coal Mine Regulation Act* and the *Mining Regulation Act*. Mine rescue training is completed under the direction of the Coordinators, Rescue Training, for the areas in which their stations are located.

During the six-year period 1975–1980 there were many staff changes in the Branch, most notable of which were the retirements of many of the senior officers and the changes resulting therefrom.

> Mr. J. W. (Bill) Peck retired as Chief Inspector in April 1977 after 32 years of valuable service.
>
> Mr. J. E. (Jack) Merrett retired as Deputy Chief Inspector in September 1977 after 30 years service. He was Acting Chief Inspector between April and September, 1977.
>
> Mr. A. R. C. (Tony) James retired as Senior Inspector (Coal) and Aid to Securities in March 1978 after 28 years service.
>
> Mr. T. H. (Tommy) Robertson retired in April 1977 after 20 years service as Coordinator, Mine Rescue Training in Nanaimo.

As a result of these retirements, there were changes in organization and transfers of Inspectors to different districts. The listing below shows the appointments at December 31, 1980.

INSPECTORS AND RESIDENT ENGINEERS, DECEMBER 31, 1980

W. C. Robinson, Chief Inspector of Mines	Victoria
V. E. Dawson, Deputy Chief Inspector of Mines (Coal and Special Services)	Victoria
A. J. Richardson, Deputy Chief Inspector of Mines (Metal)	Victoria
H. J. Dennis, Senior Inspector of Mines (Coal)	Victoria
T. G. Carter, Senior Mechanical-Electrical Inspector	Victoria
J. Cartwright, Electrical Inspector	Victoria
P. E. Olson, Road Engineer	Victoria
J. D. McDonald, Senior Reclamation Inspector	Victoria
D. M. Galbraith, Reclamation Inspector	Victoria
J. C. Errington, Reclamation Inspector (Agrologist)	Victoria
R. T. Martin, Geotechnical Inspector	Victoria
S. Elias, Senior Environmental Control Inspector	Vancouver
D. J. Murray, Environmental Control Inspector	Vancouver
S. J. L. Miller, Environmental Control Inspector	Vancouver
R. Kumar, Environmental Control Inspector	Vancouver
V. Pyplacz, Audiologist, Environmental Control	Vancouver
J. C. Ferguson, Environmental Control Inspector—Technician	Vancouver
A. Parker, Environmental Control (Noise) Inspector—Technician	Vancouver
B. M. Dudas, Inspector of Mines and Resident Engineer	Vancouver
W. H. Childress, Inspector of Mines—Technician	Vancouver
J. W. Robinson, Inspector of Mines and Resident Engineer	Nanaimo
H. A. Armour, Inspector of Mines—Technician	Nanaimo

V. A. Pakalniskis, Inspector of Mines and Resident Engineer	Prince Rupert
B. Varkonyi, Inspector of Mines—Technician	Prince Rupert
S. J. Hunter, Inspector of Mines and Resident Engineer	Smithers
S. J. North, Inspector of Mines—Technician	Smithers
R. W. Lewis, Inspector of Mines and Resident Engineer	Prince George
T. Vaughan-Thomas, Inspector of Mines and Resident Engineer	Prince George
J. J. Sutherland, Inspector of Mines—Technician	Prince George
B. A. Gordon, Reclamation Inspector—Technician	Prince George
K. G. Hughes, Mechanical Inspector—Technician	Prince George
D. I. R. Henderson, Inspector of Mines and Resident Engineer	Fernie
R. Bone, Inspector of Mines and Resident Engineer	Fernie
D. Smith, Inspector of Mines and Resident Engineer	Kamloops
E. S. Sadar, Inspector of Mines and Resident Engineer	Kamloops
J. P. MacCulloch, Inspector of Mines and Resident Engineer	Kamloops
J. A. Thomson, Inspector of Mines—Technician	Kamloops
R. H. Heistad, Reclamation Inspector—Technician	Kamloops
J. B. C. Lang, Inspector of Mines and Resident Engineer	Nelson
M. A. Mellor, Inspector of Mines—Technician	Nelson
A. L. O'Bryan, Reclamation Inspector—Technician	Nelson
E. J. Hall, Reclamation Inspector—Technician	Fort St. John

Coordinators, Mine Rescue Training

G. J. Lee, Senior Coordinator	Victoria
R. F. Brow	Nanaimo
J. E. A. Lovestrom	Smithers
R. J. Stevenson	Prince George
B. A. McConachie	Kamloops
E. C. Ingham	Nelson
P. J. Switzer	Fernie

BOARDS OF EXAMINERS, 1980

BOARD OF EXAMINERS
(Coal Mine Regulation Act)

V. E. Dawson, Chairman	Victoria
D. Henderson, member	Fernie
H. J. Dennis, member	Victoria

The Board conducts written and practical examinations for the various certificates of competency under the provisions of sections 25 and 26 of the *Coal Mine Regulation Act*, and advises the Minister on the granting of interchange certificates under this Act. Under the new Act the Board is no longer responsible for issuing coal miners' certificates; these are now issued after examination by the District Inspector.

BOARD OF EXAMINERS
(Mining Regulation Act)

A. J. Richardson, Chairman	Victoria
B. M. Dudas, member	Vancouver
E. Sadar, member	Kamloops

The Board conducts written examinations in various mining centres for applicants for underground and surface shiftboss certificates. The Board is also empowered to grant provisional certificates without examination and under such conditions as the Board considers necessary.

ACTS

In 1976 the name of the Department of Mines and Petroleum Resources was changed to the Ministry of Mines and Petroleum Resources and in 1978 the Ministry was augmented by the addition of an Energy Division and became the Ministry of Energy, Mines and Petroleum Resources.

In 1979 the *Mines Regulation Act* was renamed the *Mining Regulation Act* and the *Coal Mines Regulation Act* became the *Coal Mine Regulation Act*. These new Acts incorporated a number of minor revisions.

FATAL ACCIDENTS, 1975–1980

The following table shows the number and type of property on which 34 fatalities occurred in the 1975–1980 period, of these 5 were construction or drilling workers and 2 were unconnected with the mining industry and were not recorded as occurring to an individual in the mining industry although details are included below.

Year	Type of Property							Totals
	Metal Mines			Coal Mines		Gravel Pits	Quarries	
	Underground	Surface	Other	Underground	Surface			
1975	2	3	1		2			8
1976	7	1	1	1			1	11
1977	3		1		1			5
1978	2							2
1979	1	3				1*		5
1980	1		1			1*		3
Totals	16	7	4	1	3	2*	1	34

* Not recorded as occurring to an individual employed in the mining industry.

Below is a tabulation of the mines at which fatal accidents occurred each year and a comparison with those occurring in 1974.

NUMBER OF FATAL ACCIDENTS — With Comparison Figures for 1974

Company	Location	1975	1976	1977	1978	1979	1980	Total	1974
Atlin Silver Corp.	Atlin		1					1	
Bethlehem Copper Corp.	Ashcroft		1					1	1
Bordignan Masonery	Nelson Island							0	1
Carolin Mines	Ladner Creek (N./Hope)					1		1	
Cassiar Asbestos	Cassiar	1						1	
Churchill Copper Corp.	Fort Nelson							0	1
Cominco Ltd.									
Fording Coal	Elkford	2		1				3	
H.B. Mine	Salmo	1						1	
Sullivan Mine	Kimberley	1	2	1				4	
Craigmont Mines	Merritt			1				1	
Dekalb Mining Corp.	Highland Valley						1	1	
Domtar Chemicals Ltd.	Blubber Bay		1					1	
Granduc Operating Co.	Stewart							0	1
Highmont Mines	Highland Valley					1		1	
Kaiser Resourses Ltd.									
Balmer Hydraulic	Michel		1					1	1
Lockie Creek Placer	Tulameen							0	1
Lornex Mining Corp. Ltd.	Logan Lake	1						1	
Newmont Mines (Similkameen Div.)	Smelter Lake			1		1		2	
Noranda Mines Ltd.									
Boss Mountain Mine	Hendrix Lake		1					1	
Ocean Construction Supplies Northern Ltd.	Kitimat					1*		1*	
Reeves MacDonald Mines Ltd.	Remac							0	1
Silvana Mines Inc.	Sandon				1			1	
Surgenor Gravel Pit	Comox						1*	1*	
Teck Corp Ltd.	Beaverdell	1						1	
Texada Mines Ltd.	Gillies Bay		2					2	
Utah Mines Ltd.	Port Hardy	1						1	2
Wesfob Mines Ltd.	Tasu		1		1			2	
Western Mines Ltd.	Myra Falls		1					1	3
	Buttle Lake			1				1	
	Campbell River					1		1	
	Lynx Mine						1		
Totals		8	11	5	2	5	3	34	12

* Not recorded as occurring to an individual employed in the mining industry.

The following table classifies fatalities as to cause and location.

FATALITIES AS TO CAUSE AND LOCATION

Cause	Surface						Underground					
	1975	1976	1977	1978	1979	1980	1975	1976	1977	1978	1979	1980
Coal Mines												
Caught in machinery								1				
Surface equipment			1									
Transportation	2											
Sub Total	2	0	1	—	0	0	0	1	0	0	0	0
Mines Other than Coal												
Asphyxia (gas or lack of oxygen)					1				1			
Buried in muck										1		1
Caught in machinery	1					1		1				
Electrocution	1											
Explosives								2				
Fall of ground		1			1		1		1	1		
Fall of persons	1				1						1	
Haulage—												
Track		1						2				
Trackless		2			1			1	1			
Struck by flying object	1											
Surface equipment			1			1						
Transportation							1					
Sub Total	4	4	1	—	4	2	2	6	3	2	1	1
TOTAL	6	4	2	—	4	2	2	7	3	2	1	1

ACCIDENTS CAUSING DEATH OR INJURY — CLASSIFIED

The following tables classify the accidents causing death or injury by year, which were reported to the Branch.

The accidents are classified as to: Cause, occupation of those injured, and parts of the body injured.

ACCIDENTS CAUSING DEATH OR INJURY CLASSIFIED AS TO CAUSE

Cause	1975		1976		1977		1978		1979		1980	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Coal Mines												
Atmosphere	3	1.7					4	1.8	4	1.8	4	2.0
Explosives	1	0.5					1	0.4	1	0.5	3	1.5
Falls of ground	12	6.6	7	4.4	15	9.6	17	7.5	30	13.8	20	10.2
Falls of persons	53	29.3	41	25.3	53	34.0	81	35.7	5.9	27.1	47	24.0
Lifting and handling material	33	18.2	35	21.6	41	26.3	67	29.5	71	32.5	50	25.5
Machinery and tools	42	23.2	44	27.1	18	11.5	20	8.8	19	8.7	29	14.8
Transportation	15	8.3	22	13.6	6	3.8	17	7.5	10	4.6	27	13.8
Miscellaneous	22	12.2	13	8.0	23	14.8	20	8.8	24	11.0	16	8.2
Totals	181	100	162	100	156	100	227	100	218	100	196	100
Mines Other Than Coal												
Atmosphere	6	1.7	4	0.8	2	0.4	5	1.4			1	0.2
Explosives	2	0.5			2	0.4	1	0.3				
Falls of ground	31	8.6	39	8.2	39	7.3	22	6.2	2	0.9	3	0.7
Falls of persons	96	26.7	116	24.4	137	25.6	97	27.4	45	19.3	112	25.7
Lifting and handling material	44	12.3	82	17.3	114	21.3	71	20.0	19	8.1	122	28.0
Machinery and tools	94	26.2	101	21.3	121	22.6	93	26.3	132	56.6	123	28.2
Transportation	14	3.9	45	9.5	25	4.7	20	5.7	17	7.3	30	6.9
Miscellaneous	72	20.1	88	18.5	95	17.7	45	12.7	18	7.8	45	10.3
Totals	359	100	475	100	535	100	354	100	233	100	436	100

ACCIDENTS CAUSING DEATH OR INJURY CLASSIFIED AS TO THE OCCUPATION OF THOSE INJURED

Occupation	1975		1976		1977		1978		1979[2]		1980[2]	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Coal Mines												
Underground												
Chutemen							5	2.2	4	1.8	3	1.5
Haulagemen	10	5.5	2	1.2	2	1.3	6	2.7	7	3.2	2	1.0
Miners	6	3.3	37	22.8	49	31.4	75	33.0	44	20.2	36	18.4
Helpers			7	4.4	3	1.9	8	3.5	18	8.3		
Timbermen and facemen	4	2.2					1	0.4	4	1.8		
Mechanics (electricians, supplymen, welders)	7	3.8	4	2.5	7	4.5	15	6.6	9	4.1	16	8.2
Miscellaneous	24	13.3	4	2.5	6	3.9	13	5.7	9	4.1	10	5.1
Surface												
Mechanics	35	19.3	51	31.4	30	19.2	43	19.0	48	22.0	57	29.0
Mill and crusher workers	5	2.8	8	4.9			4	1.8	8	3.7	6	3.1
Carpenters and labourers	5	2.8	2	1.2	2	1.3					7	3.6
Miners and drillers	31	17.1	7	4.4	7	4.5	9	4.0	12	5.5	9	4.6
Vehicle drivers	39	21.6	5	3.1	15	9.6	30	13.2	32	14.7	24	12.2
Miscellaneous			12	7.4	35	22.4	18	7.9	23	10.6	26	13.3
Surveyors, labourers[1], construction, etc.	15	8.3	23	14.2								
Total underground	181	100	162	100	156	100	227	100	218	100	196	100
Mines Other Than Coal												
Underground												
Chutemen	2	0.6	4	0.8	1	0.2	4	1.1			1	0.2
Haulagemen	18	5.0	27	5.7	39	7.3	18	5.1	16	6.9	34	7.8
Miners	66	18.4	44	9.3	49	9.2	42	11.9	23	9.9	33	7.6
Helpers	15	4.2	22	4.6	7	1.3	8	2.3	11	4.7	39	8.9
Timbermen and facemen	7	1.9	17	3.6	13	2.4	12	3.4	14	6.0	8	1.8
Mechanics (electricians, supplymen, welders, etc.	11	3.1	15	3.2	21	3.9	18	5.1	11	4.7	52	11.9
Miscellaneous	2	0.6	20	4.2	15	2.8	12	3.4			2	0.5
Surface												
Mechanics	92	25.6	100	21.1	106	19.8	73	20.6	43	18.5	57	13.1
Mill and crusher workers	51	14.2	37	7.8	76	14.2	55	15.5	48	20.6	70	16.1
Carpenters and labourers	5	1.4	7	1.5	11	2.1	30	8.5	55	23.6	12	2.8
Miners and drillers	7	1.9	57	12.0	53	9.9	12	3.4			4	0.9
Vehicle drivers	33	9.2	19	4.0	8	1.4	37	10.5	12	5.1	38	8.7
Miscellaneous	8	2.2	40	8.4	86	16.2	33	9.3			6	1.4
Surveyors, labourers[1], construction, etc.	42	11.7	66	13.9	50	9.3					80[3]	18.3
Total surface	359	100	475	100	535	100	354	100	233	100	436	100

[1] 1975 to 1977 only available.

[2] 1979 and 1980 statistics are unreliable — records not available.

[3] Includes construction.

ACCIDENTS CAUSING DEATH OR INJURY CLASSIFIED AS TO PARTS OF THE BODY

Location	1975		1976		1977		1978		1979[2]		1980[2]	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Coal Mines												
Eyes	7	3.9	2	1.2	9	5.8	5	2.2	19	8.7	17	8.7
Head, face and neck	11	6.1	13	8.0	10	6.4	18	7.9	19	8.7	21	10.7
Trunk	50	27.6	55	33.9	56	35.9	84	37.0	71	32.6	60	30.6
Upper extremities	46	25.4	48	29.7	25	16.0	55	24.2	55	25.2	37	18.9
Lower extremities	52	28.7	33	20.4	49	31.4	48	21.2	52	23.9	50	25.5
General	15	8.3	11	6.8	7	4.5	17	7.5	2	0.9	11	5.6
	181	100	162	100	156	100	227	100	218	100	196	100
Mines Other Than Coal												
Eyes	14	3.9	30	6.3	49	9.2	14	3.9	18	7.7	23	5.3
Head, face and neck	14	3.9	36	7.6	28	5.2	20	5.6	9	3.9	17	3.9
Trunk	119	33.1	130	27.3	174	32.5	140	39.5	86	36.9	142	32.6
Upper extremities	89	24.8	116	24.5	149	27.8	76	21.4	49	21.0	112	25.7
Lower extremities	103	28.7	144	30.3	124	23.2	94	26.5	59	25.3	120	27.5
General	20	5.6	19	4.0	11	2.1	10	2.8	12	5.2	22	5.0
Totals	359	100	475	100	535	100	354	100	233	100	436	100

A chronological description of each fatal accident for the years 1975 to 1980 follows:

Fatal Accidents, 1975

William James Bell, aged 49 years, married and employed as a diamond-drill helper by Logan Diamond Drilling Company Ltd., at the H.B. Mine near Salmo died of strangulation on January 16th, subsequent to the loose clothing he was wearing being caught in the rapidly rotating drill rods. In addition the water hose and drill-rod hoist cable were wrapped around him. The deceased had been employed as a drill helper for a period of about nine months, and on the day of the accident was employed at a surface drill set-up.

The wire-line drill was set up on a steep hillside and was drilling a hole inclined at 5 degrees below horizontal. In order to protect the operation from the weather, a canvas and metal-sheeted shack was constructed about the drill. A small stove, a 45-gallon water drum and a small gasoline-driven, beam pump were also inside the shack, thus creating congested conditions.

At the time of the accident the deceased apparently wanted to check the water supply and pump, and although the investigation indicated that he had been previously warned more than once not to do so while the drill was operating, he got down under the rotating drill rod. It would appear that his loose shirt tail became caught on the spinning rod and he was wound up onto it with the hoses and cable being engaged also.

The driller who was at the door of the shack stopped the drill as soon as he heard the unusual noise and with assistance from a nearby workman removed Bell within ten minutes. Mouth-to-mouth resuscitation was given but he did not respond to this treatment and was pronounced dead by the doctor who examined him.

At the inquest held in Salmo on February 12th the jury's verdict was as follows:—

> "We, the Jury, having been duly empanelled, find that William James Bell of Salmo, B.C., aged 49 years, died on the 16th day of January, A.D. 1975, as a result of strangulation. We find that his death was unnatural. We find that no persons were to blame. We recommend that such operations be set up so that there is no need for persons to pass over and/or under rotating unguarded shafts."
>
> This Department is in concurrence with the recommendation made by the jury.

Michael Hashimoto, aged 29 years, single and employed as a haulage truck operator by Lornex Mining Corporation Ltd., died on February 16th, 1975, from head injuries received at their Highland Valley mine on February 5th, 1975.

The deceased and three other workmen were, with their foreman, moving a trailing, electric-power cable in order that a blasting operation could be completed. In performing this act, the foreman, who was driving a pick-up truck equipped with a cable pulling device, backed his truck to the cable on 4792 bench. The men then placed the cable over the wheel of the pulling device and moved out of the way as the truck moved forward at walking speed. Three of the four men then started to walk toward the edge of the bench in order to observe the cable as it was being drawn up. When they were about 15 feet from the edge of the bench one end of the cable to which a pothead connector was attached came flying over the edge of the bench. One of the men shouted a warning to beware of the flying pothead but Hashimoto failed to duck and was struck on the side of his head, below his hard hat. It is not known why the pothead end whipped through the air in such a manner as the cable did not appear to be under tension.

Hashimoto was given first aid treatment immediately and taken to hospital at Ashcroft but at the request of the attending doctor was immediately redirected to the hospital in Kamloops where he died on February 16th.

At the inquest held in Logan Lake on March 11th, 1975, the coroner's jury presented its statement as follows:—

> "We the Jury, having been duly empanelled, find that Michael Hashimoto of Logan Lake, B.C., aged 29 years, died on the 16th of February, 1975, as a result of cerebral injuries.
>
> We find that this death was unnatural and that it was accidental.
>
> We find that we attach no blame to any person in connection with this death.
>
> We recommend that more safety precautions be carried out in that a signal man should ensure that all persons involved should be well back of any possible mishap."

Alfred Attrill, aged 32 years, divorced and employed as a miner by Teck Corporation Limited at the Highland Bell mine at Beaverdell was instantly killed on February 6th, 1975, when crushed by a fall of ground.

On the day of the accident, Attrill, who was considered an experienced miner, was using a mucking machine and locomotive on No. 4 level while working on the final clean down of 415 stope. This stope, inclined at approximately 30 degrees, is approximately 8 feet wide, 150 feet long and had been mined up dip for about 60 feet. The west side of the stope abuts the West Terminal Fault,—a major control structure associated with the ore occurrence. The stope was mined from 30 to 40 years ago and the waste at the time, which was anything less than 100 ounces of silver per ton, was left in the stope. It was this material that Attrill was recovering.

At 9:30 a.m. on February 6th the mine superintendent visited the deceased at 415 stope and inspected the working place and found it to be in normal condition. At 12 noon the shiftboss visited it and found that a very large slab had fallen from the hanging wall and was lying in large fragments on the ore being removed. Attrill was nowhere evident so a search was made throughout the mine and then excavating commenced in the area where he was working. Because of the size and position of the slab fragments, muck removal was hampered. When all other methods of breaking them failed, bulldozing was resorted to and Attrill's body was found at 6 a.m., February 7th under a slab estimated to be 20 tons in weight. His scaling bar was found nearby.

It is presumed Attrill had noticed a loose slab on the hanging wall and was attempting to dislodge it when the large mass fell. It was reported that, although this stope had been opened with the hanging wall unsupported for at least 30 years, no spalling had occurred during that period. The investigation disclosed that the timbering in the West Terminal Fault indicated crushing and some movement had taken place recently. It is possible this movement developed the slab along incipient fractures within the hanging wall.

At the inquest held in Greenwood on March 6th, 1975, the verdict given by the jury was as follows:—

> "We, the members of the Coroner's Jury, do find that Alfred Attrill, while working in the 415 stope at the Teck mine in Beaverdell, met his death by accident caused by a large fall of rock from the hanging wall.

> We recommend that this type of open stope be timbered by stulls as work progressed forward in the drift.
>
> And that Rule 251 (a) (aa), (b), (c), (d), (e), (f) and (g), of the *Mines Regulation Act* be adhered to."

In view of the jury's recommendations the District Inspector has advised it is his opinion that at this operation timbering and roof bolts have always been used where considered necessary, however, it is possible, in view of the long history of stable rock conditions, a false sense of security may have developed. Additionally, it is his belief this mine has operated in compliance with Rule 251 of the *Mines Regulation Act* in that there are an adequate number of qualified supervisors employed who have performed their duties as required by this Rule. It is his belief, also, that no workman is required to work in an area where he considers a condition of unusual hazard exists.

Kenneth Forest Heinman, aged 33 years, single and employed as an ironworker by Humphrey Construction Limited, died on February 21st, 1975, as a result of injuries sustained in a fall from the third floor of the construction site of the new primary concentrator of Cassiar Asbestos Limited at Cassiar.

On the day of the accident Heinman and his partner were placing the Hazemag crusher onto the third floor on which only part of the metal subfloor had been laid because of late deliveries of material for this purpose. Chain blocks were being used to float and to pull the equipment into place prior to settling it on its base. One such chain block to which a choker cable was attached was anchored on a column about 4 feet away from the platform on which Heinman stood. As this choker was required, Heinman, who was an experienced steel construction worker, apparently walked out on an 8-inch wide steel floor support girder to grasp the choker. It is believed the choker had snagged on something and in attempting to free it, it is believed he overbalanced and fell.

It is believed he struck his head on a steel beam as he fell through the second floor and then fell across the steel support girders for the conveyor access platform on the first floor.

He was immediately removed and taken to the Cassiar hospital where he died about 1¼ hours later.

At the inquest held in Cassiar on April 30th, 1975, the jury returned the following verdict:

> "We, the Jury, having been duly impanelled, find that Kenneth Forest Heinman of 4317 Cliffmont Road, North Vancouver, B.C., aged 33 years, died on the 21st day of February, 1975, as a result of contusion of the brain, fractured skull, perforated lungs, ruptured liver, multiple fractured ribs, compound fracture of the right leg. We find this death was unnatural and it was accidental. We find that no blame is attached to any person in connection with the death and can make no obvious recommendations other than the normal safety measures be followed."
>
> The jury did not include any recommendations but the District Inspector advised that it was his belief that Mr. Heinman's death could be attributed to having a work platform of inadequate width, and therefore recommended that closer attention be paid to ensuring that temporary work platforms are installed to cover the total area on which it is necessary for men to work or move. In addition, adequate guard rails must be provided.

On April 25th, 1975, *Eugene F. McVerry*, aged 36 years, single and employed as a heavy duty mechanic by Utah Mines Ltd. at the Island Copper Mine was electrocuted at about

6.30 a.m. when he came into contact with a power source of 4160 volts while performing mechanical work on an electrically-powered shovel.

The deceased, along with another heavy duty mechanic, a repairman and the maintenance foreman, had completed afternoon shift on April 24th and were asked to work overtime on the repair of a swing-motor transmission on P.H. shovel SHE-127. The shovel of 15-cubic-yard capacity was a 2100 BL series model. This crew was assisted on the overtime shift by a repairman and a crane operator.

To change the transmission it was necessary to disconnect the swing-motor first. The power to the motor was disconnected, but the main power supply to the shovel was not as it was being used to run a compressor for supplying compressed air to operate an impact wrench being used to loosen nuts on the bolts holding the transmission to the shovel floor. While attempting to remove the nuts it was found that the whole bolt assembly was turning so McVerry volunteered to go into the slip-ring chamber below in order to hold the bolt heads.

The slip-ring chamber is centrally located under the shovel floor and contains three concentric copper rings approximately ½ × 2 inches in cross section, equally spaced between approximate diameters of 3 feet to 8 feet. These rings are about 10½ inches between the outer ring and the chamber wall. The rings and their brush contacts enable power to be transmitted without interruption from the external source to the on-board switch gear on the movable shovel body even though the body may rotate any angular distance. Entry to the chamber is by way of either of two ports located under the shovel body and between the shovel tracks. Access is normally barred by double locked gates covering the ports, but at the time of the accident only one port entry was locked.

McVerry climbed through one port opening and got into the 17½-inch space to hold the bold heads while the nuts were being removed, after which he came out and stopped for a coffee break. The investigation disclosed that at coffee break a discussion was held concerning the cutting off of electric power to the shovel but McVerry indicated that, although he knew the slip rings were energized, he did not believe them to be of any serious concern. It is altogether possible he believed the power to have been in the nature of 440 volts as was the case on another shovel on the property.

After coffee break and on replacing the transmission assembly McVerry climbed back into the slip ring chamber to hold the bolt heads while the bolts were being tightened. Some difficulty was experienced in tightening the last bolt and, while McVerry was working on it, another workman saw flames and sparks. As McVerry did not respond to a call, the power was shut off and an extinguisher was used to put out the fire on McVerry's clothing. As McVerry was blocking the entry into which he climbed, the lock was broken on the other gate and a workman got in to assist in removing McVerry. As soon as this was done, cardiac massage and mouth-to-mouth resuscitation were given. McVerry was taken to the hospital but was pronounced dead by the doctor who attended him.

The investigation of this accident indicated that, at the time it occurred, work was being done on an electrically-powered shovel by a four-man crew, of which no member had locked out and tagged the disconnector controlling power to the shovel.

At the inquest held in Port Hardy on May 15th, 1975, the following verdict was given by the jury:

> "We, the Jury, having been duly empanelled, find that Eugene F. McVerry of Port Hardy, B.C., aged 36 years, died on the 25th day of April, 1975, as a result of electrocution. We find that this death was unnatural and that it was accidental. We find that the deceased was negligent by failing to heed warnings by co-workers not to enter the machine before the power was disconnected.

We recommend that:

1. The company conduct a more comprehensive safety program upon hiring of employees.
2. Supervisory personnel be fully familiar with the operation of equipment they are supervising.
3. Regularly scheduled safety meetings be held for all crews, with supervisors in attendance.
4. Inspections at regular intervals of the safety equipment on machines by the Safety Committee.
5. Regular checks by the Safety Committee to ensure that safety procedures are followed.
6. The use of auxiliary power and compressors while working on shovels and drills.
7. Overtime periods be limited, when possible, to avoid unnecessary fatigue to workers."

The recommendations of the jury are concurred with.

John Henry Broadhurst, aged 61 years, married and employed as an Electrician-Repairman in the Sullivan mine of Cominco Ltd., at Kimberley, died instantly on September 22nd, 1975, from injuries received when run over by a moving train. The deceased and his helper were working on day shift and had been servicing electrical equipment on 3700 level in the vicinity of the track switch to the crushing chamber incline and to the ore loading chutes. While they were doing this a locomotive brought in two cars loaded with cement, gravel and a cement mixer. The operator halted at the switch to obtain directions for switching the two cars he was pushing. The deceased, his partner and a construction foreman entered into discussion with the motorman and decided to shunt the two cars onto a side track. Before moving the train the motorman switched on the backing headlight and blew the horn on the locomotive. As the train backed up, Broadhurst attempted to cross the track in front of it. He was knocked down and dragged about 50 feet before it stopped, after the foreman flagged down its motion. On being removed from under the car, he was pronounced dead by the attending doctor.

As the load was high in the two cars it was not possible for the motorman to see in front of his train and it is possible, due to the noise of a nearby ventilating fan, that Broadhurst did not hear the horn signal. It is surmised Broadhurst was crossing the tracks to go to a small service locomotive standing on an adjacent track. It is also possible that, due to a physical handicap of a lame leg, Broadhurst may have stumbled and fallen in front of the train as it moved.

The inquest into the death of Mr. Broadhurst was held in Kimberley on October 22nd, 1975, at which the jury returned the following verdict:

> "We, the Jury, having been duly empanelled, find that John Henry Broadhurst of Kimberley, British Columbia, aged 61 years, died on the 22nd day of September, 1975, as a result of being run over by an ore car. We find that this death was unnatural and that it was accidental. We find that no person present in the operation is responsible for the death of John Henry Broadhurst.
>
> and
>
> We attach no blame to any person in connection with the death.
>
> 1. We recommend that material should not be piled high to obstruct the vision of the loci. driver.

2. A flat car should be used to haul materials.
3. A switchman should be used when the train is manually operated pushing cars.
4. There should be a red light on end car of train."

This Department concurs in general with the foregoing recommendations but as indicated in items one and three wherever vision to the locomotive operative operator is restricted, a brakeman or switchman should assist him.

Fergus McKenzie, aged 20 years, single, and employed as a driver instructor, and *Bhim Raj*, aged 27 years, married, and employed as a trainee driver at the Fording Coal mine of Cominco Ltd., died by drowning on December 15, 1975, when the truck in which they were riding ran off the road and into a settling pond.

At about 8.30 p.m. December 14th, Raj was driving a 120-ton Wabco coal haulage truck and was accompanied by McKenzie. Raj had dumped a load of coal at the breaker station and was returning for another load. He drove in a northerly direction for about 1,200 feet then turned to the west to descend the 8 per cent road ramp over the Fording River. About 400 feet down ramp from the corner the truck skidded sideways, ran over a 3-foot berm at the edge of the road, then about 80 feet down the embankment to break through the ice on the settling pond at the bottom. The truck cab was submerged and the two men drowned before they could be released. On going over the road edge the truck struck and knocked down a power pole.

Eyewitnesses to the accident advised that the truck was travelling at a speed possibly in excess of 16 miles per hour and that the driver appeared to have some difficulty in controlling the steering, particularly on the slushy road surface which, although slippery, was not icy. In addition to the excessive speed, it was also noted that on the downgrade the truck was travelling on the wrong side of the road and that the dynamic brake light (yellow) was lit, indicating that this brake was being engaged. However, as the speed was high, it may not have been effective. The red light for the service brakes was also burning, indicating these too were being engaged. It is possible the joint application caused the wheels to skid and the momentum of the vehicle carried it over the bank.

On being removed, the mechanical and electrical components of both the brake and steering systems were thoroughly examined and were found to be in satisfactory operation condition except for damage caused in running down the embankment or in the removal of the truck from the pond.

At the inquest held in Sparwood on January 16, 1976, the jury agreed on the following verdict:

> "We, the Jury, having been duly empanelled, find that Fergus MacKenzie and Bhim Raj died on December 14th, 1975 at approximately 8.40 p.m. as a result of drowning.
>
> We find that this death was unnatural and that it was accidental.
>
> We attach no blame to any person in connection with the death.
>
> We recommend that:
>
> 1. Training of new haulage truck operators to be done only on the daylight hours.

2. We would like to recommend that the safety berms be increased substantially and maintained.
3. Strong enforcement of down hill speed limits and regulated to road conditions."

This Department would concur where practical with the recommendations presented.

Fatal Accidents, 1976

Marcel Robert, aged 20 years, single, and employed as a transloader operator by Texada Mines Ltd., died on February 6th from injuries received after he either jumped or was thrown off a low-profile telescopic ore carrier in the Texada Island iron mine. This ore carrier, otherwise known as a Teletram, has a specially designed telescoping dump box.

On the day of the accident the deceased was detailed to accompany one of the regular drivers, in order to receive instruction in the driving of the Teletram. At the same time, the regular driver and the trainee were warned that the trainee was not to drive the vehicle alone during the shift. The work cycle required the vehicle to be loaded with ore at a chute, trammed a distance of 671 metres to an ore transfer raise to unload, and then to return for another load. After loading, the vehicle ascended a grade of plus 15 per cent for a distance of 91 metres, then descended a minus 5 per cent grade for 488 metres, and then down a steeper grade of 15 per cent for a 91-metre distance to a flat area at the transfer raise.

At the commencement of the shift, the operator demonstrated to the deceased the method of checking the brakes and steering before starting to use the vehicle. They then loaded the ore carrier and trammed it to the transfer raise, during which time the operator stopped at the commencement of the minus 15 per cent grade where he changed the gears down from third to second. He explained to the trainee that this was necessary to prevent over-speeding down-grade. The load was taken to the transfer raise, dumped, and then the Teletram returned to the loading point for its second load. The driver observed the same gearing down procedures as before and continued down to unload. On returning, the driver stopped at the top of the ramp at the transfer raise and permitted the trainee to drive back to the loading chute. The succeeding three trips were driven in both directions by the trainee, during which time he stopped to change down as he had been directed.

After lunch, as the trainee was cold, the driver told him to stay on the warm machine while the driver refilled the loading chute. On returning to the draw point, the regular driver found that Robert and the Teletram were gone. He obtained a Transloader and drove along the route of travel and, as he was descending the final ramp, he was stopped by the brother of the deceased, who reported his brother appeared badly hurt and the Teletram had run into the wall in a nearby draw-point drift.

First aid services were obtained right away and Robert was removed to the Gillies Bay medical clinic and then to the hospital at Powell River, where he died about seven hours after the accident. The autopsy performed indicated death was caused primarily by a laceration of the left lung by fractured ribs, which led to internal hemorrhaging. Other injuries included several fractured ribs and severe laceration of the right leg.

An examination of the route of travel indicated the Teletram had first struck the right wall of the steep down-ramp and then the left wall, subsequent to which Robert either jumped or was ejected from the seat. An investigation indicated that, on striking the left wall, the impact had sheared the left front and rear wheel brake-drum bolts, thus slewing the vehicle to the right on application of the brakes. After Robert landed on the floor of the ramp, it is believed the frame of the Teletram passed over him, giving him the injuries he received.

At the Coroner's inquest held in Powell River on March 18, 1976, the following verdict was given by the jury:

> "We, the Jury, having been duly empanelled, find that Marcel Robert of Texada Island, aged 20 years, died on February 6, 1976, as a result of falling out or jumping out of an ore-carrier. We find that the death was unnatural and that it was accidental. We attach no blame to any person or persons in connection with his death. We recommend a study be made by qualified personnel to determine if any restraining equipment should be required for the safe operation of ore-carriers."
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> The District Inspector's comments concerning the recommendation was that the use of seat belts in cars has lowered injury frequency but studies have indicated, where heavy equipment is involved, 50 per cent of the time the use of restraining belts have, no doubt, prevented injury but that also in 50 per cent of the time, the safest thing for the operator to have done was to jump off the vehicle.
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> The Chief Inspector's office concurs in the jury's verdict and the District Inspector's comments respecting Marcel Robert's misadventure.

Keith Firth, aged 26 years, married and employed as a faceman by Kaiser Resources Limited in the Balmer South or Hydraulic mine at Sparwood, died on April 2, 1976, from injuried sustained when crushed between the tail conveyor of a continuous miner and the rib or wall of No. 1 Entry as the machine was being moved to another work location.

At the time of the accident the deceased was feeding an electric power cable onto the tail conveyor to be coiled as the machine was backing toward him. The continuous miner was hugging the rib on the operator's side, in order to avoid materials stacked on the opposite side of the entry. While so doing, a cable support wire hanging from a roadway arch caught the cap lamp of the operator and pulled his hand on one of the controls of one of the caterpillar tracks of the vehicle. This action caused the vehicle to slew rapidly and the tail conveyor struck Firth, who was bending over picking up a loop of cable that had fallen from the conveyor. Firth, who was caught between the conveyor and rib, sustained such severe injuries that he died enroute to the hospital.

At the inquest held in Sparwood on April 27, 1976, the jury returned the following verdict:

> "We, the Jury, find the deceased Keith Firth of Fernie, B.C., came to his death due to accidental injury in No. 1 Entry Hydraulic Mine at Sparwood, B.C., (received) at 3.40 a.m. on April 2, 1976. His death was due to internal injuries and internal bleeding, caused by being crushed by the tail of a continuous miner at approximately 4.00 a.m. on April 2, 1976, while enroute by ambulance to hospital at Michel. We attach no blame to any person in connection with the death. We recommend that the utmost caution be exercised when moving a machine, and that no person other than the operator be on the side of the machine and no person beside the tail or boom."
>
> The comment of the attending District Inspector of Mines was that, inasmuch as the tail conveyor of a continuous miner is subject to sudden and rapid movement, it is recognized practice that no one should enter the area affected

by the movement of the tail conveyor. He directed strict adherence to this practice. In addition, he observed that, had the boards been removed from the roadway, the continuous miner could have moved up it without obstruction.

Raimondo Cossa, aged 23 years, single and employed as a trammer by Western Mines Limited at Myra Falls mine, was instantly killed at about 11.30 p.m. on April 7, 1976, when his head was crushed between a steel chute gate and a supporting chute post.

The chute gate was of the arc type and operated with a double-acting air operated cylinder, the control of which was performed by means of a 3-position valve. The valve was located nearly six feet from the gate. The gate movement was along an arc path from the fully closed position when the cylinder arm was extended, to the fully open position with the arm retracted. In its bottom position, the gate came into contact with the chute post.

The deceased, who had at least two years' experience in tramming and chute operation, had been directed by his shiftboss about five minutes prior to the accident to go to the chute, remove the brattice seal which had been installed to prevent spillage and to check the chute preparatory to commencing the withdrawal of ore. He apparently went to the chute and was checking the operation of the chute when he was caught by the gate, where he was found by two workmen who came by about five minutes after the shiftboss had spoken to him. They immediately released him and obtained first aid treatment, but no sign of life was detected. He was declared dead on arrival at the hospital.

There were no witnesses to the accident and, therefore, the movements of Mr. Cossa can only be conjectured. The chute gate control was found in the open position and it is presumed the gate had not moved, so Cossa went to it and looked under the chute to try to determine why. It is presumed the gate suddenly swung at that instant and crushed his head between it and the chute post. On checking the gate operation after the accident, the response to the valve control movements was immediate. It is possible that, as the gate had not been moved for some time prior to the accident, the muck behind the brattice had caused the gate to stick or, for some reason, there may have been an obstruction in the airline which reduced the air pressure, however, the investigation failed to reveal any malfunction.

The inquest was held in Campbell River on May 13, 1976, at which time the verdict given by the jury was as follows:

> "We, the Jury, having been duly empanelled, find that Raimondo Cossa of Western Mines—Myra Creek, aged 23 years, died on the 8th April 1976 at Western Mines as a result of his head being crushed between an ore chute gate and an upright. We find that death was unnatural and that it was accidental. We find that there is no evidence to show how he happened to be in such position as to receive the injuries which caused death. We recommend that consideration be given to the fixing of a suitable screen mesh to prevent any person placing any part of his body between the chute and upright."

The recommendation given by jury has been considered but it is questionable that it is practical as the controls were purposely placed remote from the chute to prevent the control operator being exposed to the movement of the gate. It is possible improved operating instructions, that the control should not be left in a move position if the gate does not immediately respond, would be the best action to take.

Barry Lee Buchan, aged 26 years, single, and *Raymond Douglas Grebliunas*, aged 27 years, married, and both employed as miners at the Sullivan mine of Cominco Limited died on July 13, 1976, subsequent to being injured during a blasting operation underground.

The two men were employed extending 38410 Sub X slusher drift to the north and in driving two opposing draw points Nos. 7 and 8 respectively on the west and east sides of the slusher drift about 7½ metres south of the face.

In reconstructing the scene of the accident it would appear the two men had drilled and loaded the three headings and had ignited the fuses, using thermalite igniter cord in the drift and in No. 8 drawpoint and were in the process of lighting No. 7 drawpoint when the drift round commenced to detonate. Both men were severely injured but Grebliunas had managed to crawl about 30 metres south to the manway while Buchan was lying about 3 metres south of No. 7 drawpoint. Both men were alive when found.

Both the slusher drift round and that in No. 8 draw point broke reasonably well with all but one of the drift holes having blasted and all in No. 8 draw point detonating. The round in No. 7 drawpoint had misfired to a large extent, the cut had broken out but several holes had detonated but had not broken the rock and there were some holes not detonated.

It was conjectured some difficulty must have been experienced in igniting the holes in No. 7 drawpoint and the men had stayed to watch the igniter cord light each fuse. This delayed the miners until the other rounds commenced to detonate.

It was also suggested the initiation of the first hole which detonated could have been the premature ignition of a lifter as the investigation completed indicated that, while one of the loaded lifter holes in the slusher drift had detonated, it had failed to break the ground about it. This resulting condition could conceivably have occurred if the normal blasting sequence in the drift round had been dislocated. In other words, if the lifter had detonated before the surrounding holes, the ground about the lifter could not normally shatter. It has, therefore, been suggested the lifter may have detonated prematurely because the thermalite igniter cord connecting to that hole was ignited ahead of any other in that round. The early ignition of the thermalite lead to the lifter may have been caused from any of a variety of reasons, including a spark falling from the burning igniter cord above, a short-circuited connection with the igniter cord or a falling rock striking and igniting the cord. However, as the fuses used were 2.44 metres long, it would indicate the men had remained in the blast area at least 5 minutes 20 seconds after the fuse had started to burn, during which period there should have been ample time to light the other two rounds and retreat to a safe location.

The inquest was held in Kimberley on September 9th, at which time the Coroner's Jury gave the following verdict and recommendations:

> "We, the Jury, find that Barry Lee Buchan and Raymond Douglas Grebliunas met their deaths in the Sullivan Mine in 38410 Sub X at approximately 10.19 p.m. on July 13th, 1976. We also find that the above mentioned died unnaturally and accidentally from an explosion.
>
> We attach no blame to any person in connection with their deaths.
>
> The jury recommends that:
>
> 1. Procedures be instituted ensuring that miners are safely away from the blast area before ignition of the round.
> 2. A fail-safe system of blast control be instituted whereby only the miners involved have access to the ignition apparatus.

3. Those involved with explosives should be made fully conversant with all the safety measures pertaining to blasting and the reasons for such measures with frequent refresher courses."

In comment, the District Inspector reported as of September 30, 1976, that all development headings are now using remote blasting switches to ignite the thermalite cord; a senior staff member has been assigned to supervise blasting procedures on a continuing basis; and the actual loading and blasting practices of individual crews are being checked at least once a week by the shiftbosses and mine captains.

Herbert George Kilback, aged 46 years, married and employed as a back-up lead-hand driver by Bethlehem Copper Corporation was fatally injured on July 15, 1976, when the 0.7-tonne, crew-cab pick-up truck in which he was sitting was run over by a 90-tonne haulage truck.

Mr. Kilback had, for the previous 5½ years, been employed operating various heavy duty vehicles in the open pit, including driving the 90-tonne ore trucks. He also had several months' experience in the work he was doing at the time of the accident.

The accident occurred in the evening during daylight hours when the deceased drove down into the work area against the direction of traffic movement to where a front-end loader was filling the 90-tonne haulage trucks. Kilback, who was to oversee the exchange of a nearby shovel for the front-end loader, parked the crew-cab truck above and to his left of the facing haulage truck waiting to be loaded. The loader operator directed the haulage truck to move ahead in order to clear the way for the loader to leave and the shovel to enter. The truck driver moved ahead until only the flashing pole light on Kilback's vehicle was visible. The truck driver waited briefly and then decided to move around the loading loop again to be in position to go to the shovel. On checking for the pole light, it was no longer visible so the truck driver assumed Kilback had departed. On moving the truck a short distance, the driver noted his vehicle appeared to be dragging and, on investigation, it was found the right front wheel of the truck had run over the crew-cab truck.

The shovel was used to lift the large truck and the loader pulled the crew-cab out from under the truck. Kilback was removed and, while no pulse was evident, he was taken by ambulance to the Ashcroft hospital where the doctor advised the injured man was dead on arrival. His death was attributed to multiple lacerations involving the liver, lung, left kidney and spleen and to multiple fractures involving the ribs, upper left arm and upper left leg.

The investigation made of the accident indicated that Kilback had moved his vehicle ahead and in front of the large truck and, although the truck driver stated he started his vehicle, brought the engine up to speed and sounded the horn, Kilback did not back out of the way.

The coroner's inquest was held in Ashcroft on October 4, 1976. The verdict stated in part:

> ". . . We find that this death was unnatural and that it was accidental. We find that we attach no blame to any living person in connection with the death. We recommend that the Company set up training and information programs as to the hazards of small vehicles in the pits."

> The District Inspector, in assessing the incident and the Jury's recommendations, made the following comment:

> "While the recommendations of the coroner's jury are to be concurred with, nevertheless, this is a case where an experienced man who would have known of the hazards associated with vehicle blind areas, unwittingly placed himself in

> a dangerous and fatal situation. Thus education, although currently the primary defense against such accidents, is not the total answer, and manufacturers should be expected to improve vehicle design and/or search for and provide positive methods of surveillance of areas blind to equipment operators, such as TV, radio, other electronic warning devices, etc.
>
> "Although perhaps not a factor in this accident, it is nevertheless suggested that the effectiveness of the height of small vehicle pole lights be evaluated against the operator's visibility while seated in his equipment, and if necessary, the light pole be extended sufficiently to indicate presence at as close a range as possible."
>
> We acknowledge and concur with the recommendations and Inspector's comment.

Leonard Donald Vickery, aged 19 years, single and employed as a jeep driver underground by Texada Mines Limited at Gillies Bay, died from crush injures to his chest on July 26, 1976, when the personnel carrier he was driving overturned.

The deceased had been employed at the mine for a period of eight months prior to the accident. During this interval he was trained in various capacities, including the operation of articulated personnel carriers and the delivery of supplies throughout the mine.

Just prior to the accident, Vickery had backed a personnel carrier up a steep ramp (+15%) to the site of a longhole drill where the driller requested Vickery to go to the surface to obtain materials to repair a broken water hose. After instructing Vickery, the driller left by another route to telephone to the surface tool crib to have the materials ready to be picked up. He returned to his work place about five minutes later and saw a light on the ramp floor about 72 metres below him. On going to the light he found the front portion of the carrier had capsized and was pinning Vickery to the floor at the junction of another ramp. At this time a transloader was coming along the main ramp to this junction. The driller halted this vehicle and then went to the phone to call for first aid assistance, which arrived within five minutes of being called. No pulse was detected in Vickery and he was removed from under the carrier after the bucket of the transloader was used to raise the carrier. Vickery was delivered to the surface where the doctor, who was already there, pronounced Vickery dead on arrival.

There were no witnesses to the accident and it is presumed that Vickery had descended the 15% grade and attempted, in one manoeuver, to turn to the right, approximately 290 degrees, to travel the other ramp, which joined the first at a re-entrant angle. It is presumed the carrier ran up onto the inner wall edge during the turn and, in so doing, overturned.

The investigation made on the vehicle found no mechanical defects were present, but that it was not equipped with roll-over protection. An exemption had been requested and granted to operate this vehicle without roll-over protection, as it was in use at the mine prior to the directive issued by the Chief Inspector of Mines, requiring that all newly installed vehicles in use underground be so equipped.

At the inquest held in Powell River on September 23, 1976, the Coroner's Jury reached the following verdict:

> "We, the Jury, having been duly empanelled, find that Leonard Donald Vickery of Gillies Bay, B.C., aged 18 years (sic., actually 19 years, 8 months) died on the 26th day of July, 1976, as a result of the accidental overturn of a personnel carrier.

> "We find that his death was unnatural and that it was accidental."
>
> There were no recommendations made to the verdict, however, the District Inspector directed that a roll-over protective structure be fabricated and installed on the vehicle.

Rory Grant Anthony Fielkowich, aged 18 years 11 months, single and employed as a truck driver by Domtar Chemicals Limited at the Blubber Bay quarry, died October 18, 1976, subsequent to being seriously injured on August 12, 1976, after backing a vehicle over the edge of a cement-rock stockpile.

Fielkowich, who had been properly trained in the use of the type of truck he was driving, was delivering a load of cement rock to the top of the stockpile when the accident occurred. He drove to the top of the pile, made a left turn and was backing to the ridge of cement rock previously dumped along the edge, when it collapsed under the rear wheels. The truck rolled back, apparently made a backward somersault, landing on the cab on the driver's side. The cab partly collapsed and the driver had his foot trapped in the cab. During the motion Fielkowich's hard hat dislodged and he sustained severe head injuries.

The investigation made concerning the accident disclosed that dumping practice was to empty the loads onto the flat dump area and to push the material over the edge with the assistance of a bulldozer. In the usual manner Fielkowich backed to the edge of the existing pile preparatory to dumping. He was aware some of the rock had been removed from the toe of the dump in that area. However, a vertical face some 3 to 4.5 metres in height existed immediately below the pile at the point where he had backed his truck. When the truck reached this point, the bank collapsed, thus precipitating the accident. No markers had been placed on the dump to warn the truck drivers of areas of possible instability, owing to the removal of muck from the toe of the dump.

The inquest was held in Powell River on February 10, 1977, at which the jury reached the following verdict:

> "We, the Jury, having been duly empanelled, find that Rory Grant Anthony Fielkowich of Blubber Bay, B.C., aged 18 years, died on the 18th of October, 1976, as a result of cystic cerebral necrosis. We find that this death was unnatural and that it was accidental. We attach no blame to any person or persons in connection with this death. We recommend that company safety standards and regulations of the *Mining Act* be closely followed. Also a closer day-to-day relationship between company supervisors and their subordinates concerning conditions in their immediate work areas be formulated."
>
> The Chief Inspector recommends that such operating practices be adopted that no loading shall take place from the toe of any stockpile unless adequate precautions have been taken to protect any person at the toe or at the top of a stockpile in the event of a collapse of the stockpile material.

Roy Joseph Gerald Hauck, aged 44 years, married and employed as a tractor-loader operator at the Tasu mine of Wesfrob Mines Limited, has been reported missing since November 3, 1976, when he and the Caterpillar loader he was operating were swept into Tasu Sound by a slide of magnetite sinter concentrate.

An uncovered stockpile of magnetite sinter concentrate had been placed on the hillside above the ship loading dock, from which it was separated by the access road from the power house to the dock. During the 18-hour period prior to the accident the exposed stockpile had been subjected to a locally recorded rainfall of 16.3 centimetres. The saturated stockpile had developed minor slumping onto the road, thus blocking access to the dock.

Hauck, who was an experienced loader operator was directed to clear the road in preparation for the arrival of a ship on November 6th. He had been working at this task for upward of a half-hour when he was visited by his supervisor. At the time, the supervisor advised Hauck that if he (Hauck) thought the pile might slide again to leave the job for another time.

Hauck had cleared about 46 metres of roadway and was working immediately below the stockpile when it slumped. Approximately 700 tonnes of concentrate slid down, spilled across the road and part carried on down into the salt water. The slumping material struck the loader and pushed it off the road and down into the water.

Three eye-witnesses saw the cab of the loader strike the ship-loading structure prior to submerging. They observed that Hauck was in the cab when this occurred.

Within 15 minutes of the accident two scuba divers were in the water searching for Hauck and the loader. About 10 minutes later the loader was located about 37 metres off-shore and in 12 metres of water. Hauck was not in the cab of the vehicle and, as there was so much mud in the water, visibility was almost nil. Several subsequent searches have been made but no trace has been found of Hauck.

The loader was salvaged on November 6th and, on examination, it was found to be in first gear forward and with the seat belts jammed under the seat. The loader has been shipped to Finning Tractor for a complete mechanical check of the brakes and steering.

As no body has been found, neither an inquiry nor an inquest has been held.

> The District Inspector, after having investigated the incident, has, in consultation with the management, initiated the following action:
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> 1. The access road was closed to all traffic, subject to item 5 below.
> 2. The size of future stockpiles was reduced by approximately one-half.
> 3. The minimum roadway width was set at 12 metres from the toe of the stockpile to the shoulder of the road.
> 4. Incidental use of the road was prohibited.
> 5. The road is to be used only when specifically authorized and only when engineering checks have preceded use to establish satisfactory stability.

Thomas Samuel Perron, aged 48 years, married and employed as a trammer by Atlin Silver Corporation Limited at the Atlin Ruffner mine, was killed in a tramming accident on November 15, 1976. He had been employed at this mine for ten days, six days of which were in tramming operations, assisted by a Mancha Little Trammer battery-operated locomotive.

At the portal of the 4100 level of the Atlin Ruffner mine a simple bridge span, approximately 8 metres in length between supports, was erected to extend the track out to a dump. The bridge extended in cantilever fashion about 2 metres beyond the outer pier. The bridge work was sufficiently high to permit the driving of trucks under the span, in order to empty the ore cars directly into the truck box.

Tramming practice was to bring two cars of ore onto the trestle, securing the cars to the rail with the aid of a chain, the car nearest the locomotive being emptied first.

While there were no witnesses to this particular accident, it is presumed in this instance the trammer took the locomotive out onto the cantilevered section, which dropped, causing the locomotive to fall about 4 metres to the foot of the pier, the loaded cars being pulled over with it. The cars fell on top of Perron and, when found, possibly a half-hour after the incident, no evidence of life was apparent. In the matter of just a few minutes, a medical doctor on the property examined Perron and pronounced him to be dead. The doctor advised that death was due to massive, multiple injuries.

During the investigation made by the District Inspector, the braking and electric control systems were found to be satisfactory except that a "dead-man" control switch was not installed in the locomotive.

The inquest was held in Atlin on November 24th and the jury returned the following verdict:

> "We, the Jury, being duly impanelled, give the verdict as follows. We find that Thomas S. Perron of 105 Copper Road, Whitehorse, Y.T., aged 48 years, died on the 15th of November 1976 as a result of cerebral vascular collapse. We find that this death was unnatural and that it was accidental. We find that it appears that the ore train at Atlin Silver Corporation's 4100-foot level, operated by Thomas S. Perron, at approximately 4.00 p.m. on the 15th day of November 1976, went beyond the normal parking position on the trestle to dump and that the extension of the structure and stopblock were insufficient to support the ore train in the second position. We recommend that:
>
> 1. The trestle structure be suitably constructed, in order to support and stop the ore train under reasonable emergency operating conditions,
>
>   and that
>
> 2. The Department of Mines institutes that more frequent inspections be made as is done in other areas of the Province not so remote as Atlin."
>
> The jury's recommendations are concurred with, however, due to staff shortages, inspections cannot be made as frequently as desirable.
>
> Subsequent to his investigation at the mine, the District Inspector directed that the use of the trestle for dumping or any other purpose is prohibited and that an adequately designed trestle, properly constructed, would be the only acceptable solution to a renewal of the current ore loading practices.

John Taylor, aged 22 years, single and employed as an underground track helper by Noranda Mines Limited at their Boss Mountain mine died on November 30, 1976, from injuries received when struck down and run over by the first muck car of an empty train returning underground in the main haulage adit.

Taylor, along with three other men, were members of the track gang who were going to work at a point about 105 metres from the portal. Enroute to their working place they were passed by the loaded train of 11 muck cars coming out to the ore bin on surface. About 15 minutes later, after the train had been emptied, it started to return underground. The switchman, who was at the portal, opened the doors for the train and looked into the adit for any sign of traffic. He noted four miners and that one of the men appeared to be walking out of the tunnel. He also looked for the cluster warning lights used by the track crew to control traffic on the line, but no lights had been mounted so he signalled the motorman to back into the mine. When the locomotive reached the portal the motorman stopped the train, on being signalled by one of the track crew. This man put a track jack on the locomotive and asked the motorman to put it off at the by-pass switch about 137 metres inside the portal. The motorman continued back into the adit and had travelled only a short distance before he noted lights moving at the right side of the train, so he stopped immediately. At that time one of the track crewmen came running back shouting, so the motorman went to investigate and became aware of the accident.

Apparently one of the track crew was using a pneumatic drill to drill a pop hole in the ditch and was standing to the side of the track when the train struck him, knocking him into the ditch. At that time Taylor had been standing in the middle of the track and was knocked down and run over. The third man had been standing in the ditch with his back to the portal. The rear car did not have a tail light on it and, as the drill was operating, they did not hear the train. In addition, the track crew, who were equipped with cluster lights, had failed to put up the lights on either side of their work location.

Taylor was quickly removed from under the train and was taken to the hospital at 100-Mile House. At the time of his removal from under the car no vital signs of life were apparent and, on reaching the hospital, he was declared dead on arrival.

The inquest was held in Williams Lake on February 3, 1977, at which the following verdict was presented:

> "We, the Jury, having been duly impanelled, find that John Gordon Taylor of 1701, 33 Robson Street, Hamilton, Ontario, aged 22 years, died on November 30, 1976, as the result of crush injury to the chest and severance of the spinal cord. We find that death was unnatural and that it was accidental. We find that it was due to negligence in respect of the following:
>
> "1. Failure of the track crew to follow safe working practices
>
> and
>
> 2. Noranda Mines Limited (Boss Mountain Division) for failure to insure that safe working practices are followed.
>
> We attach no blame to any persons in connection with the death. We recommend that Noranda Mines Limited, Boss Mountain Division, up-date, publish and enforce their safety rules and regulations, also that workmen be instructed in their use."
>
> The District and Chief Inspectors concur with the foregoing verdict.

Fatal Accidents, 1977

James Richard Hollowink, aged 32 years, married, and working as a sub-contractor, was killed on January 26, 1977, while clearing brush from the surface at the site of the proposed Taylor open pit on the Eagle Mountain operations of Fording Coal Limited near Elkford.

Two dozers (Hollowink's Terex and a D-7 Cat) were being utilized, on a sub-contract basis, to clear brush from a 35-degree slope in preparation for the proposed Taylor pit on the west face of Eagle Mountain. The dozers were executing a parallel "push" from an exploration road. Track marks of Hollowink's dozer would indicate that he accessed onto the 35-degree slope at an angle slightly removed from the line of the full dip. The blade appeared to have caught on a tree stump. This caused the machine to slew around and slide backwards down the hill, eventually rolling over (corner to corner) a number of times before coming to rest some 180 metres below the start of the push. Hollowink, who was not wearing a seat belt as the dozer was not equipped with one, was thrown out of the dozer and was found lying on the ground approximately 48 metres above the point where the dozer came to rest.

First-aid assistance was available on the scene some 15 minutes later. Hollowink was loaded into an ambulance and transferred to the Michel hospital where he was pronounced dead.

The Terex dozer when examined was found to have survived the accident fairly well, the ROPS being intact. The C-frame, blade, exhaust stack, and battery (which would appear to have not been secured) were found at various points of the path of the dozer down the slope. The machine was examined at the mine and at Calgary (by the Terex representatives). Apart from the lack of hydraulic fluid (quite likely lost during the accident) no mechanical defects were found.

The investigating inspector's initial reaction was that the slope (35°) was in fact much too steep to permit the operation of the dozer without some form of anchorage being utilized. However, it is understood that the two dozers had been operating on similar slopes for several months prior to the accident and had employed a yo-yo system at times when the slope had been considered too steep. It would appear on this particular occasion that the slope was not considered to be excessive.

Discussions with experienced dozer operators would indicate some difference of opinion as to the maximum safe working slope for dozers. This would appear to vary according to the work history of the individual, bush or open pit.

An inquest was held in Sparwood on April 28, 1977, when the following verdict was returned:

> "We, the Jury, having been duly empanelled, find that James Richard Hollowink of Elkford, B.C., aged 32 years, died on the 26th of January, 1977, at or about 12.30 p.m. as a result of an extensive skull fracture and severe brain contusion. We find that this death was unnatural and that it was accidental.
>
> "We attach no blame to any person in connection with the death. We recommend that all machines should be checked by a mechanically knowledgeable person with written records kept with regard to safety items as per Workers' Compensation Board Regulations (sic) and Company policy. This inspection to be carried out by Mines Department Personnel or Company Personnel at the time of machines arrival on the Company property and at regular intervals thereafter. This includes subcontractors and Company machines."
>
> The District Inspector, while concurring with the jury's findings, felt that they had not been explicit enough in not pointing out that the tractor was not equipped with seat belts as required by the *Coal Mines Regulation Act*, and that both the contractor and the mine management had failed to adhere to section 27 of this Act in that neither parties had ensured the vehicle was equipped as required in Rule 205 (c).

Ernest Grams, aged 59 years, married, and employed as an employee-training supervisor by Craigmont Mines Limited, died on February 4, 1977, subsequent to having been struck and run over by a loaded scooptram on 2813 level of Craigmont mine.

At the time of the accident, 12.40 p.m., the deceased was standing in the middle of 2813 drift at its juncture with 29 drift where a two-boom production drill was operating about 5 metres ahead of them. Grams was explaining to a new employee the type of drilling that was being done, and had advised the man to put on his safety glasses and ear muffs. At that instant the new man felt something touch him and he saw the bucket of a scooptram coming at him. He immediately ran ahead and jumped to safety in the next crosscut and signalled the scooptram operator to stop. On looking back they saw Grams lying in the drift. On checking him they realized he was badly injured so phoned out immediately for help, but as someone had tampered with one of the phones, the message was not received at the lunchroom on 2813 level. As a result a further delay of 10 minutes occurred in getting the message to the surface and Grams was not delivered there to the first-aid attendant until 1.30 p.m. Those persons transporting him said he went unconscious at 1.15 p.m., and appeared to be experiencing breathing difficulties. On arrival at the Merritt hospital at 2.00 p.m., the attending doctor pronounced Grams to be dead on arrival.

The investigation indicated the scooptram operator had been hauling ore from production drift 33A and dumping it into 780 orepass, but when it became full he then proceeded to the 761 orepass to unload. Enroute to this orepass he apparently struck Grams because, when the bucket was elevated, the driver's field of vision ahead was so restricted he did not see Grams or the other workman.

At the inquest held in Merritt on February 23, 1977, the jury returned the following verdict:

> "We, the Jury, being duly impanelled, find that the death of Ernest Grams occurred sometime between 1 p.m. and 2 p.m. on February 4, 1977, at or near Merritt, B.C. Death was caused by shock from an industrial accident. We recommend daily checks of the communication system throughout the mine and the repair of such be of top priority.
>
> In addition to the jury's recommendation the District Inspector suggested the following as improvements to work practices:
>
> "1. Encourage the wearing of CSA-approved white hard hats and/or CSA-approved hard hats with clean reflector tapes around them.
>
> 2. While in travelways (haulageways) every person shall carry their cap lamps on their hard hats and the cap lamp must be turned on.
>
> 3. In haulageways where the vision of the driver of trackless loading equipment is obstructed in its use, the driver shall ensure that some form of traffic barriers are installed in the haulageway on either end of the travel route of the equipment, and no vehicle or person shall pass through the restricted travel zone without clearance being obtained from the driver of the loading equipment for each passage through the zone."
>
> The jury's recommendation and those of the District Inspector are well taken but in addition it is believed that inasmuch as the death of Ernest Grams was attributed to *shock*, special emphasis should be made to provide not only the initial Safety Oriented First Aid Training (SOFA) in the survival rescue training requirements of section 23, rule 116 (e) of the *Mines Regulation Act*, but SOFA *refresher* training should be on a continuing basis similar to other first-aid training courses.

James Stuart Tiffin, aged 40 years, married, and employed as a "hot-muck" miner at the Sullivan mine of Cominco Limited at Kimberley, died on March 2, 1977, subsequent to falling at least 90 metres down an underground orepass on 3500 level.

On the day of the accident Tiffin was working on 3661 crosscut west where he was bypassing ore from the 207 orepass above him into the orepass below him. When the lower orepass was full he proceeded to the 3500 level to bypass this ore down through the ore transfer system below this level.

As the ore being transferred originated from stopes where it had been subject to spontaneous ignition, large amounts of heat, dust and sulphur dioxide were freed each time it was moved or transferred. Because of these problems certain crew members have been trained, and were designated to handle the movement of the muck even in areas where it was remote from the stopes where it was first drawn. In addition, ore transfer raises or bypasses have been sealed off from other headings and maintained at negative ventilation pressures to minimize dust escape. Further, the transfer or bypass points and the dumps have been equipped with remotely controlled close-fitting doors.

Operating experience has determined certain practices which tend to improve dust control during transfer operations. These practices include constraining the pulling of bypasses until they are empty but leaving them with a cool muck barrier behind the chute fingers to prevent upcast ventilation in the raise system. These practices have also included restraint from opening dump doors until at least one-half an hour after bypassing operations have halted. This delay permits the dust to settle or be exhausted with SO_2 from the transfer raises. This prevents the operating workings from being flooded with contaminated air during dumping operations. Another operating procedure developed was to require that persons bypassing ore shut off the air supply to the remote control valve operating the dump door.

At the time of the accident, about 4.30 p.m., the deceased was at the 3500 level orepass bypassing ore when a loaded ore train approached the dump. On passing the remote valve control for the dump door and dump block the motorman pulled the activating cord to set both objects into the dump operating position. He then continued toward the dump with the train behind him but stopped about 3 metres north of the dumping position on being flagged down by Tiffin. By this time the dump door was fully open. This allowed steam and red dust to billow up on to the level. The motorman saw Tiffin attempting to put on his respirator as he was enveloped in the steam and dust. The motorman left the locomotive and crawled back about 25 metres to seek refuge from the cloud in an old lunch room where he believes he was overcome for about five minutes because of the gas and dust he had inhaled. On reviving he went out onto the level and closed the dump door by operating the remote control valve. He then backed the train 4 to 6 metres when another workman came onto the scene. After a joint unsuccessful search for Tiffin they called their supervisor by telephone to report what had happened. The motorman then went for oxygen therapy treatment at the First-Aid room and was subsequently admitted to hospital for further treatment.

Meanwhile the supervisor arrived at the accident scene and instituted a more extensive search for Tiffin who still remained missing. It was then presumed Tiffin must have fallen down the orepass so dumping into it was then suspended but this was not until after some 80 cars of ore had been dumped into it after Tiffin was first reported missing.

The District Inspector who had been notified of the accident arrived at the property after midnight. After discussion with management and the police, a decision was made to draw down the material in the orepass in searching for this missing man. This action commenced prior to 2 a.m. It was not until 9 a.m. that Tiffin's body was located and not until 1 p.m. before it was possible to safely recover it.

After investigation the Inspector concluded the accident was attributable to a communication breakdown and personal error by the workman. The communication breakdown occurred because neither the deceased nor the motorman had been alerted to the possibility that the other individual or some other individual would be working in the same location. The personal error occurred when the deceased failed to shut off the compressed air supply to the dump door and its control.

The inquest took place on Thursday, April 21, 1977, at 1900 hours in the Provincial Courthouse, Kimberley, British Columbia.

The deposition was as follows:

> "We, the Jury, having been duly empanelled, find that Stuart Tiffin of Wycliffe, B.C., aged 40, died on March 2nd, 1977, as a result of massive injuries to the upper chest and head.
>
> "We find that his death was unnatural and that it was accidental.
>
> "We find that both Cominco and Stuart Tiffin contributed to this death as follows: We find that there was:
>
> a lack of supervisory communication.
> a lack of enforcement of safety regulations.
> the presence of dust.
>
> "Stuart Tiffin helped to contribute to his own death as he was aware of the dangers involved and should not have conducted the transfer alone.
>
> "We recommend that:
>
> much closer communication be maintained between all supervisory personnel, before and during shift work.
>
> a definite time table be established and be maintained for the transfer of ore.
>
> present safety procedures should be strictly re-enforced by further training periods.
>
> regulations should be strictly enforced by knowledgeable supervisory personnel.
>
> a self-contained breathing apparatus be used during the transfer of ore."

Procedural and physical changes in dumping and transferring operations were put into effect by the company immediately after the accident. The work is now done under one foreman's guidance on any one shift. In this way, communications between various workers in the area of activity are continuous and complete. Ventilation in operational areas has been closely checked and made more effective. Control valves have been relocated and interlocked so that dump doors and dump blocks cannot be activated during bypassing operations and vice-versa. Two persons will now form a bypassing crew. Finally, should a person be required to enter the bypassing chamber, they shall wear a self-contained breathing apparatus. It is not necessary to wear this apparatus outside the chamber, with above procedures being in effect.

Walter Rosswell, aged 50 years, married, and employed as a miner by Western Mines Limited, was almost instantly killed between 8.50 a.m. and 12.15 p.m. on March 11, 1977, when struck by a fall of ground in 9-R-55 stope of the Lynx mine at Buttle Lake. Mr. Rosswell was an experienced miner having worked in this capacity at this mine for the past seven years.

Because of unstable ground conditions in this stope, mining is done by cut-and-fill procedures. Normally a 2-meter-high advance is made along the length of the stope after which the walls and back are scaled and secured with rock bolts and straps. In this stope this procedure had been followed, but the stope had reached up to the level of the sub-drift above, thus when the sill portion had been blasted the exposed stope wall increased from 2 to 5 metres to the back of the sub-drift. The deceased had blasted out the sill pillar the day previous, and the cross shift scraped the ore away leaving the south wall exposed.

On going on shift, Rosswell was instructed to continue drilling and blasting the bench in his stope, however, when the shiftboss visited the stope at about 8.25 a.m. and after spending about 25 minutes in the stope examining the walls with Rosswell, he directed Rosswell not to continue benching until he had installed three steel support straps on the south wall. As each strap requires three rock bolts, Rosswell needed to drill 9 holes of sufficient length to hold the 2.44-metre (8-foot) rock bolts being used.

The shift boss left the workings about 8.50 a.m. and on returning at 12.15 p.m. found Rosswell buried under a cave of ground from the hangingwall where he had commenced rock bolting. Recovery work was started about 20 minutes later, but Rosswell was not released until about 3.00 p.m. During this time no signs of life were apparent.

The investigation made of the accident scene indicated the deceased had installed a strap and three bolts prior to the failure, but that the cave involved not only that portion of the hangingwall but also a portion of the wall where previous rock bolting and strapping had been done, as the caved area contained nine rock bolts. It was determined that one rock bolt had snapped while the remainder had pulled out. It was also noted that a slip extended back into the hangingwall beyond the end of the bolt holes which were 2.44 metres (8 feet) in length, thus indicating they had been ineffective.

At the inquest held in Campbell River the following verdict was reached by the jury:

> "We, the Jury, having been duly empanelled, find that Walter Rosswell of 2700 Woodburn Rd., Campbell River, aged 50 years, died on the 11th March, 1977, as a result of severe crushing injuries to the chest caused by a fall of rock while working in 9-R-55 stope at Western Mines. We find that death was unnatural and find that it was accidental. We attach no blame to any person in connection with the death."

The District Inspector has recommended that in areas where extensive ground support is needed in the stope walls, and where more than normal wall exposures are being developed, additional support such as with the use of timber should be provided. This recommendation has the concurrence of the Chief Inspector.

Gordon Leonard Murray Turner, aged 28 years, married, and employed by Newmont Mines Limited, Similkameen Division, as a tailings pond operator, was instantly killed at the Smelter Lake East tailings dam between the hours of 4.00 p.m. and 4.35 p.m. on October 8, 1977, while operating a D-6 caterpillar tractor.

The tailings pond operator's duties are to check the pumps, return water lines, tailings lines, sand cyclones, and to push away from the cyclones the build-up sands with a D-6 caterpillar tractor. The sands are used to build the dam, and are placed on the dam by a Wabco scraper. The Wabco scraper is operated by a second person. The fines from the cyclones are discharged into the tailings pond via a 20.32-centimetre plastic overflow line. Whenever the tractor is required to work around the cyclones it has to cross over the plastic overflow line. To prevent damage to the line, the sand is built up around it to form a bridge.

This day the bridge was near the edge of a 9-metre-high sand bank. The day shift tailings pond operator contemplated building a new cross-over, however, after inspecting it on foot he thought it to be safe and proceeded with his other duties. Before the end of his shift, he leveled the sand around the cyclones and moved the cyclones. About 3.30 p.m. he parked the D-6 caterpillar tractor on the ramp leading to the sand pile and went to the dry building which is located about half a mile from the work area.

The day shift tailings pond operator met Turner at the dry and told him that the sand piles were leveled and the cyclones moved, thus, he need not worry about operating the D-6 for a while. He also told Turner that it was quite windy on the sand pile and due to the blowing sand, the visibility was poor, which is not unusual for this time of the year.

Turner left the dry at 4.00 p.m. and told his co-worker, the scraper operator, that he was on his way to do his checks.

The scraper operator remained in the dry for a while and left for his work place about 4.20 p.m. Both the scraper operator and the tailings pond operator are provided with a pick-up which is equipped with a two-way radio.

The scraper operator arrived at the sand pile about 4.30 p.m. and since he had not seen the tractor, his curiosity led him to walk up to the top of the sand pile. He noted on the opposite side of the sand pile that the tractor was about 9 metres down on its track idling, but there was no sign of Turner. He also noted Turner's hard hat about 4.5 metres down the slope, and he became worried about the safety of Turner. He made a frantic search in and about the tractor and upon realizing that he was not succeeding, he called for help on the radio. The centre monitoring control at the mill recorded this call to be made at 4.35 p.m.

Rescue personnel were on the scene at approximately 5.00 p.m., and Turner was found at approximately 5.30 p.m. with his legs pinned under the right tracks (uphill side) and covered with about 0.60 metres of sand. There appeared to be no sign of life and Turner was pronounced dead at the Princeton hospital about 6.15 p.m. by the attending doctor. A subsequent autopsy report confirmed that Turner died instantly due to a broken neck and severe crushing injuries.

Investigations indicate that Turner was attempting to drive the D-6 tractor over the previously established route toward the sand cyclones and he drove the tractor too close to the edge of the sand bank which collapsed near the cross-over, causing the tractor to roll on its side 360 degrees. The tractor was equipped with approved roll-over protective structure and seat belts. There was no damage to the tractor or the R.O.P. structure. The seat belt was found tucked under the seat, showing no sign that it was used. Other operators confirmed that the seat belt was not used.

The investigations could not shed any light on the reason why Turner decided to operate the D-6 tractor when only a few minutes earlier he was told that the visibility was poor and no immediate work was needed on the sand pile.

The day after the accident, the D-6 caterpillar was checked out and found to be in good mechanical order; however, for some undetermined reason, the fan was reversed which would have aggravated the visibility problem by fanning dust toward the operator.

The inquest was held on November 16, 1977, at 1000 hours in the Provincial Courthouse, Princeton, British Columbia, and the findings of the jury were as follows:

> "The jury says that:
>
> Gordon Leonard Murray Turner came to his death at Smelter Lake tailings pond, Newmont Mines, approximately 10 miles west of Princeton, B.C., on October 8, 1977, at approximately 4.00–4.35 p.m., with the cause of death

being accidental with negligence on the part of Cat Operator Gordon Leonard Murray Turner, because:

1. Ignoring warnings concerning dust conditions from previous shift worker, and that no work was needed in area at that time.
2. Not checking the area previously by foot or truck before operating the Cat in the area which is a Company policy.
3. Operator either jumped or was thrown from the equipment after it left its regular direction of travel resulting in operator ending up at the bottom of embankment with the Cat track on top of him, causing crushing, multiple internal and external injuries and sudden death.

The jury recommends that:

1. The Company put all employees through thorough screening test on equipment to verify that they are qualified to operate the equipment in all applicable conditions.
2. The Company to have training programs.
3. The Company to hold regular monthly safety meetings on the dam site to point out to operators the dangers of the tailings pond working conditions."

In addition to the jury's recommendations, the District Inspector, in consultation with the Safety Committee and the Company requested improvements in the following areas:

1. Fans on all tractors be secured in the forward direction and regularly checked by the supervisors that the fans were not reversed.
2. More shovels and probes to be located nearer to the sand cyclone operation and its location well marked.
3. Every person operating equipment must be made aware of the use of seat belts requirement and encouraged to use seat belts. (In this case the wearing of the seat belt would have most likely prevented the tragic death of the operator.)
4. Tractor operators be encouraged to inspect their travel routes on foot before operating the equipment near the edge of the sand banks.
5. The operators regularly be instructed to recognize dangerous embankments and be instructed to avoid such areas.

Fatal Accidents, 1978

Craig Ewart Mitchell, aged 22 years, single, and employed as a loader operator by Wesfrob Mines Ltd., died on April 11, 1978 from injuries received due to the sudden movement of rock in a hung-up ore pass.

On the day of the accident the deceased was employed as an underground equipment operator hauling ore from 60 orepass in the 220 decline. Mitchell and his partner, M. Holliday, were preparing to blast a hang-up above the chute from an Alimak Climber tail drift originally used for driving the orepass.

There were no witnesses to the accident as Holliday had left Mitchell to prepare the charge while he returned an empty "B-Line" spool to the level. While on the level Holliday started his truck and backed it about 30 metres back up the ramp out of the way. On returning, Holliday stated that he heard rocks falling, saw the chute fill up, and heard Mitchell call his name. Holliday stated that he knew what had happened, and tried the phone near the chute to call for help but found it was out of order. He then drove his truck up the 220 decline to the portal, phoned for help, and waited at the surface until help arrived.

The mine rescue team arrived at the scene of the accident to find that Mitchell was not visible. They could, however, hear him calling, and subsequently found him buried under the muck.

Additional experienced miners were summoned. A bulkhead was installed in the orepass above, and rock removal from around Mitchell commenced.

The rescue operation took approximately 7½ hours, during which time Mitchell was conscious but apparently developing deep shock as time progressed.

Mitchell was taken to the Tasu Medical Clinic where the doctor's initial examination indicated that Mitchell was in reasonably good condition with no apparent fractures.

Mitchell's condition deteriorated progressively for 5 hours, and he died at 1.05 a.m. on April 11th with the doctor and two nurses in attendance.

The autopsy report lists the cause of death as hemorrhagic edema of the lungs with crush injury to the legs.

At the coroner's inquest held in Queen Charlotte City on September 16, 1978, the following verdict was given by the jury:

> "We, the Jury, having been duly impanelled, find that Craig Ewart Mitchell of Tasu, B.C., aged 22, died on the 11th day of April as a result of crush injuries. We find that this death was unnatural and that it was accidental. We find that Craig Ewart Mitchell was primarily to blame in connection with his death.
>
> "We recommend that the Inspector of Mines undertake an immediate inspection of the property to ensure all areas of the mine site are inspected in a thorough manner. The doctor and nurses on the property are to make a review of medical examination procedures in the clinic to ensure that omissions do not occur. We recommend that the Inspector of Mines, Management and the Safety Committee provide more active enforcement of the *Mines Regulation Act* and that they adopt a more aggressive policy in pursuing safety problems."

Ewald Doose, aged 45 years, married with two children, employed as a miner by Silvana Mines Inc., Sandon, died from internal injuries sustained when struck by a fall of ground, and carried 13 metres down a boxhole over which he was drifting.

At the time of the accident, 8.30 p.m., August 16, 1978, the deceased was collaring a raise round in a subdrift above a boxhole. Vibrations from drilling caused about a tonne of gouge and ore to fall from the hangingwall slip. This loose may have hit Doose, but at least it broke the drill staging and carried Doose down to a lower subdrift where he was found.

The inquest was held on October 26, 1978, at the Silverton Municipal Hall. The jury returned the following verdict:

> "Ewald Doose died of internal injuries sustained by falling rock on August 16th, 1978, about 8.30 p.m. in the No. 3 Boxhole, subdrift west, 4600 level of the Silvana Mine, Sandon, B.C.

"We, the Jury, find the death of Ewald Doose to be accidental with no blame attached to anyone.

"The Jury concurs with the Mine Inspector's report that in collaring raises, more attention must be paid to ground support and scaling."

The attending Mining Inspector's comments were that the 4625 lateral subdrift was not properly scaled or roofbolted, and while scaling had been done over the No. 3 boxhole, it was obviously not sufficient to prevent a fall of ground. In collaring raises more attention must be paid to ground support.

Fatal Accidents, 1979

Frank G. Dragon, aged 45 years, married and employed as a slusher operator by Western Mines Ltd., Campbell River, was fatally injured on January 23, 1979, by falling from 13-G-Zone Upper South Drill Drift into Number 20 Drawpoint, 17 metres below the drill drift.

At 7.30 p.m. on the day of the accident, Dragon was instructed by his shiftboss to proceed to his working area in the 13-G-Zone Upper Scram Drift, and to commence scraping ore from Numbers 17, 18, 19, 20, 22 and 24 Drawpoints into the orepass. Dragon left the mine dry at that time and travelled to the 10 level adit of the Lynx mine, and to the 12 level via the shaft. Dragon, and several of the men who were working in the area, were then transported to the 13-G-Zone area via man cars. Dragon and L. Rada, who was the last person to see Dragon alive, travelled along 12-435 Drift West to their respective access manways to their place of work. The time was then 8.00 p.m.

At 8.20 p.m. the shiftboss, G. Kretzschmar, arrived on the 13-G-Zone Upper Drill Drift elevation, and found Dragon's lunch pail, and four .609-metre rock bolts by the top of the manway which leads to the lower drill drift. He did not see Dragon at this time, but assumed that Dragon had gone to another stope to get an extra slusher block. Mr. Kretzschmar continued on down the manway and checked the Scram Drift without finding Dragon. At this time he decided to continue on his beat and check on other men who were under his supervision. At 10.00 p.m. he returned to the 13-G-Zone Upper Scram Drift, and found that Dragon had still not arrived there. Kretzschmar then proceeded to the 13-G-Zone Upper Long Hole Stope, and had Rada accompany him to the 13-G-Zone Upper Drill Drift to help him search for Dragon. They checked Numbers 24 and 26 Drawpoints and found them empty. They then checked Numbers 18 and 20 Drawpoints. Number 20 Drawpoint seemed to have very little muck in it, but Number 18 had a fair amount. At this time Kretzschmar felt that Dragon had passed by a barricade with a sign "Danger Keep Out Open Holes", in order to check on the amount of broken ore in Numbers 18 and 20 Drawpoints, and had lost his balance and fallen into Number 18 Drawpoint.

Kretzschmar immediately posted Rada to guard the area, and went to the surface to summon help to search for Dragon. The Mine Superintendent, A. J. Stewart, and the Mine Captain, A. C. Bruce, were contacted and proceeded underground immediately to help organize the search. All mining in the area was curtailed at this time, and all men were brought to the 13-G-Zone Lower Drill Drift and started to excavate the broken ore from Number 18 Drawpoint by hand, using pails to hoist it up, and dump it into Number 16 Drawpoint. Heavy timber was brought down from 12 Level to shore up the muck pile.

The Mines Inspector was contacted by the Mine Superintendent at 1.15 a.m., and he proceeded underground immediately, arriving at the location on the 13-G-Zone Upper South Drill Drift at approximately 1.45 a.m. Once again all Drawpoints were checked, and the decision was made to continue hand mucking out Number 18 Drawpoint. More timber was installed to block up loose muck, but it was apparent that it was going to possibly endanger the lives of other workers. At this time it was discussed again with the Mine Superintendent, and it was suggested that all workers would go down to the Upper Scram, and pull muck out of Number 18 Drawpoint by hand using grub hooks, and scrape it back in the scram with the electric slusher. This worked quite well, and Number 18 Drawpoint was emptied by 4.15 a.m. with no sign of Dragon. Once again search parties of two men each were dispatched to 12 and 13 Levels to check all dead-end headings in case Dragon had gone to either level for some unknown reason. At this time it was decided to empty Number 20 Drawpoint, and only a little was removed by grub hook when signs of blood were noticed on the rock, eye glasses appeared, and a moment later, with the removal of more rock with a grub hook, Dragon's body slid out with the remainder of the muck, head first. The time was 5.10 a.m. January 24, 1979.

Dragon was immediately checked for signs of life by qualifed first-aid persons who were at the scene, and no sign of life was detected. The body was transferred by stretcher to the surface via the 13 Level to the 14 Level in the Main Service Raise, and thence to the surface and the first-aid room. At this time he was again checked for signs of life by A. Steward, E. Sader, the Assistant Mine Manager, and the Mines Inspector.

At the inquest held in Campbell River on February 24, 1979, the following verdict was given by the jury:

> "We, the Jury, having been duly empanelled, find that Frank G. Dragon of Campbell River, B.C., aged 45 years, died on the 24th January, 1979, as a result of respiratory insufficiency. We find that this death was unnatural and find that it was accidental. We attach no blame to any person in connection with the death. No recommendations."

Ronald G. Alford, a grademan, was run over and killed at a construction site at the Highmont mine project in Highland Valley on July 18, 1979. Mr. Alford was employed by Dawson Construction Ltd. He was born July 6, 1922, and had no known dependants at the time of the accident. Mr. Alford was hired as an experienced grademan on April 30, 1979. His other duties included those of first-aid attendant, and safety man.

At the time of the accident, Mr. Alford has risen from a crouch position he had assumed to take a hand-level shot on a survey stake. He turned with head down and stepped into the side of a scraper passing by at 3–4 km/h. He fell and was run over by the right rear wheel, which is on the blind side of view of the scraper operator. Just prior to the accident, the scraper operator had stopped nearby to receive fill orders from a bulldozer operator. He then mounted his machine again, ensured himself it was safe to proceed, and put his equipment into motion. The bulldozer operator witnessed the entire accident as it happened. Another nearby scraper operator was witness to the final seconds of the tragedy.

At the inquest held in Kamloops on September 14, 1979, the following verdict was given by the jury:

> "We, the Jury, find that Ronald Goodson Alford . . . died on July 18, 1979, as a result of multiple injuries. We find that the death was accidental and unnatural.
>
> "We recommend that high visibility clothes, orange safety vests and hard hats be worn by persons working in areas where heavy equipment is working, also that convex mirrors be used on the blind side of the operator. These are used at Afton Mines on similar equipment."

Steve Kassa, aged 46 years, employed as an ironworker by Dominion Bridge, died on September 14, 1979, as a result of injuries received from a fall while working on the west bridge tower erection at Newmont Mines, Similkameen Division, Princeton.

On the day of the accident, the deceased was employed along with a partner, Archie Jack, to assist during the erection of a suspension bridge tower, specifically to steady by means of a tag line, a wind strut section being hoisted from the ground by a crane.

The wind strut section had been hoisted to the vertical position and as hoisting continued Kassa and Jack controlled the sway and twist of the section by means of a hemp rope (tag line) attached to the bottom of the strut. Several witnesses state that Kassa stepped into a loop of the rope as the wind strut was being raised and swung toward the bridge tower. He was then lifted from the ground and swung over a lower elevation work area. The half hitch around Kassa's leg released and he fell approximately 7 metres, landing on his right upper back on level ground.

A Newmont first-aid attendant arrived at the scene within a few minutes. According to witnesses who were with Kassa immediately after the fall, he was conscious and able to speak; however shortly after the first-aid man arrived and before being placed in the ambulance, Kassa lost consciousness. Despite fast and efficient treatment it is believed that death occurred before the ambulance had left the property. In any case Kassa was pronounced "dead on arrival" at Princeton Hospital.

Elapsed time from the time of accident to arrival at the hospital was approximately 30 minutes.

The autopsy report gives the cause of death as haemorrhagic shock due to bleeding from an extensive laceration on the liver. Contributory factors were a ruptured spleen and a fracture of the right femur.

At the coroner's inquest held in Princeton on November 7, 1979, the following recommendations were given by the jury:

1. Tag line should be placed in more orderly fashion on the ground.
2. Tag line site should be in orderly condition.
3. Crane operator should be in radio communication with ground supervision.
4. Emergency vehicles should be kept in better maintenance, although maintenance of ambulance was not a factor in this deceased's death.
5. Training of industrial first-aid attendants should include intravenous therapy.

Daniel Emile Pawlachuk, aged 38 years, employed as a miner by White Mine Development, died on December 9, 1979, as a result of injuries received during a mud slide at Carolin Mines' Ladner Creek Project near Hope.

White Mine Development, employing about 10 men, were contracting the driveage of two adits to be followed by further mine development at this property. On the date of the accident the mining crew normally driving the upper (900 metre) adit had joined the crew at the lower (800 metre) adit due to heavy flows of surface water on the access roads and in the vicinity of the upper portal. A total of six men were thus employed for the dayshift at the lower adit site where a new 10 metre × 20 metre shop building had been constructed. The building contained two diesel generator units, a first-aid room and a large quantity of mining gear and supplies. Large doors at each end of the building provided vehicle access and a 5-metre-wide roadway between the building's north wall and the cut bank above provided road access to the two adit sites.

A 60-cm snowfall followed by several days of heavy rainfall preceded the mud slide on December 9, 1979. The lower adit mining crew was taking a coffee break along with the upper adit crew who had been filling in time diverting run-off water on the roadways. One man was using an ST2B scooptram to muck small mud slides between the shop building and the lower adit portal. The miners on coffee break were sitting in a crewcab truck which they parked inside the shop building, primarily to get out of the way of the scooptram. One of these five men, having finished his break, left the truck and the building to find a chain saw which was at the adit portal.

At 2.30 p.m. while four men were in the truck inside the building, the two men outside observed a small mud slide (estimated at 200–300 cubic metres) flow across the roadway against the north side of the shop building. The weight and momentum was sufficient to move the building and contents over the crest of the levelled work area and down the slope towards West Ladner Creek. The building disintegrated and, along with the contents, ultimately came to rest over a slope distance of approximately 60 metres.

At the time the building and contents began to move, one of the miners decided to leave the truck and was fatally injured in the subsequent tumbling of equipment down the hillside. Of the three miners who remained in the truck, two sustained minor injuries while the third required emergency medical treatment for various injuries. The third man was trapped for over an hour in the vehicle and much credit is due the other men on site for their efforts to free him under difficult and hazardous conditions. Mr. Pawlachuk was located about 10 minutes after the slide under a diesel generator unit which had come to rest against a stump. The deceased had suffered severe head injuries and no sign of life could be determined by the rescue crew, one of whom was trained in first-aid. The body was left at the site due to darkness, poor footing and the continuing slide hazard.

The two slightly injured men were transported to hospital in Hope, arriving at about 4.20 p.m. The third man was freed from the crewcab about 4.00 p.m. and transported to Hope, arriving at the hospital about 5.00 p.m. At this time several mud slides on the mine access and Coquihalla roads prevented further vehicle traffic, and R.C.M.P. postponed the accident site investigation until the following day.

At 9.00 p.m. December 10, 1979, the R.C.M.P., General Manager of Carolin Mines, Coroner and Inspector of Mines arrived at the mine site where investigation of the accident was completed. The Coroner examined and removed the deceased to Hope.

Permission by the Inspector of Mines was given to mine personnel to begin salvage and cleanup at the accident scene as well as continuing mine development work.

No coroner's inquest was held into this fatality although one was requested by the Ministry of Mines.

*Darryl James Hunter,** aged 13 years, and a member of the Beaver Scout Unit of Kitimat, died on December 13, 1979, as a result of suffocation after being buried in a sand slide at the property of Ocean Construction Supplies Northern Limited of Kitimat.

A group of scouts from the Beaver Scout Unit of Kitimat, under direction and control of their scoutmaster, had been bagging sandbags at the location of the .95 cm covered storage plant of Ocean Construction Supplies Northern Ltd. The bags were being assembled for sale as vehicle ballast by the group in order to raise monies for scouting. Inspections of the site had been made and approvals had been received by the secretary-treasurer of the scouts and the local manager of the Ocean Construction Company. Bagging had been progressing over two occasions and a total of 500 22-kg bags had been prepared for sale.

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* This accident was not recorded as occurring to an individual employed in the mining industry.

On the evening of December 13, 1979, a group of six scouts and the scoutmaster resumed bagging operations at the site. In the course of the evening one of the scouts left the group activity and proceeded to climb up the pile and slide down. He was rebuked and cautioned by the scoutmaster several times and he was also warned by his fellow scouts. In spite of these warnings, he continued to climb the pile and descended finally in a prone, sliding action.

His action precipitated a minor slide of sand which engulfed him at the base of the pile.

His companions witnessed his descent and dilemma and tried to uncover him by digging by hand under direction of the scoutmaster. Realizing that their efforts were futile and time was critical, the scoutmaster summoned police, ambulance and a front-end loader. The scout was uncovered after three scoops had been removed by the loader.

The inquest was held at Kitimat on January 9, 1980, at which time the Coroner's Jury gave the following verdict:

> "We, the Jury, having been duly empanelled, have determined that Darryl James Hunter of Kitimat, B.C., aged 13 years, died on 13th of December, 1979, between 8.00 p.m. and 8.30 p.m. at the plant of Ocean Construction Supplies, as a result of suffocation from a sand slide. The sand slide was induced by Darryl James Hunter climbing up and down the sand pile. There is no blame attached and there are no recommendations."
>
> In comment, the District Inspector reported that the sand pile consisted of dry, coarse sand which was stable at a natural slope of .60 radians.

Fatal Accidents, 1980

Jacob John Esau, aged 47 years, married and employed as a miner in the Lynx mine of Western Mines Ltd., Campbell River, was fatally injured on March 11, 1980, by being drawn down and being covered up by the broken ore in the orepass raise of the 13B-39 stope.

At 7.30 p.m., the beginning of that shift, Esau was instructed by his foreman to make himself a level place to work on, scale the pillar wall, build a work platform and install nine rockbolts and three metal straps to secure the pillar wall above the orepass.

For the first three hours of the shift Esau used his electric slusher to fill the orepass and to form a level area of broken ore about 1 metre above the top of the orepass. He then scaled the pillar wall. He then placed a ladder on that floor of the broken ore to support the leg of the jackleg drill but did not build the work platform to stand on and did not fasten his safety line to his safety belt.

Esau drilled one hole in the pillar wall, put on one metal strap and inserted one rockbolt. While he was using the drill to tighten the rockbolt the broken ore suddenly went down about 1 metre. Esau was not hurt but one foot was caught in the broken ore. Within a few minutes the shiftboss entered the stope. He hurried over to help Esau and asked if there was any chance that the trammer was pulling the chute. He reports that Esau said that the trammer was not pulling the chute and that the muck just settled because of the drill water.

The shiftboss ran and got the lifeline which was only 5 metres away. He snapped it to his safety belt, and then using a 1.8-metre scaling bar, and standing on the ladder which was across the hole Esau was in, he barred out two rocks. Just as they were removing the third and final rock which was holding Esau's ankle, the muck suddenly went down again in the millhole and Esau disappeared under the muck.

The shiftboss ran and got help. He sent one man to the level below to tell the trammer not to pull the chute. He then returned to the 13G-39 stope with the other miners and started rescue procedures to recover Esau.

The Safety Director and Mine Superintendent were notified and they soon came to the stope with 10 men and directed the recovery operation. The neck and shoulder of Esau were uncovered at 6.00 a.m. The Safety Director could find no pulse and no sign of life. The body of Esau was recovered and carried to the surface at 10.35 a.m.

The investigation revealed a breakdown of communications. The shiftboss stated that he gave the trammer explicit instructions on two occasions during the shift not to open that chute, but did not tell the trammer that the miner was working on the muck above the chute. The trammer stated that he had been told only that he was in charge of that chute and denied that he received any instructions or orders to keep it closed.

Three errors led to this fatal accident and steps were taken to prevent any chance for a recurrence.

Esau, a thoroughly experienced miner, failed to construct a work platform for himself to stand on to protect himself from any draw down or any settlement of the muck. He should also have moved his safety line, which was only 3 metres away, and fastened it to his belt. All miners have again been instructed to comply with these requirements and supervisors have been instructed to ensure that everyone does comply.

In addition, a mechanical locking device is to be secured to the controls of any chute if the drawing of the ore from that chute would endanger the miner up above. The shiftboss is required to retain the key for the locked chute until he is satisfied that the ore can be pulled again.

An inquest was held in Campbell River on May 15, 1980, and the following verdict was given by the jury:

> "We, the Jury, having been duly empanelled, find that Jacob John Esau of Campbell River, aged 47 years, died on the 11th day of March 1980, at or near Lynx Mine near Campbell River as a result of suffocation due to being buried in a mill-hole whilst employed as a miner with Western Mines.
>
> "We recommend that a procedure for locking out chutes be implemented whereby the shiftboss in charge takes full responsibility for the removal of said lock.
>
> "Secondly we recommend that the use of lifelines be more strictly enforced.
>
> "We also feel it would be beneficial if the Ministry of Mines were to submit their investigative report to the inquest."

Kimberly Cecil Roy Daw, aged 18 years, single and employed as a mill labourer by Dekalb Mining Corporation, Highland Valley operation, came to his death on September 19, 1980, when he was working with a fellow employee in the fine-ore bin when he became trapped in a slide of muck and was drawn into the draw-down zone of a feeder where he suffocated.

Neither man was wearing safety equipment. Daw had been sent to the bin as a precautionary measure when the foreman learned that a person had entered the bin alone.

The fine ore bin is a wood stave cylindrical tank 8.5 metres by 11.5 metres. The tank bottom is flat with a wooden-sided slot to which are attached three small manually operated gravity feeders 15 centimetres by 27 centimetres in cross-section mounted in line over the ball mill feed conveyor belt. Poke holes along the slot permit the use of bars and lances to keep the muck flowing. The ball mill operator was running only one feeder at the time of the accident. He indicated there was a shortage of feed, so he entered the bin to work it for more muck. Later measurements showed the bin to be about half full.

The crusher was shut down at the time the ball mill operator entered the bin. The flotation operator, on learning that the ball mill operator was in the bin, gave the information to the crusher operator who was with the mill foreman at the time. The foreman was concerned that the person was working alone and sent his step-son, Kim Daw, there to work with him. He advised Daw to wear a safety belt and line on entering. The foreman indicated he would also be going there shortly, since the crusher would be starting and they would have to be advised to get out. The accident took place very quickly. Time estimates indicate that only 40–60 minutes elapsed from Daw's entry into the bin to his extrication.

Daw had entered the bin and worked alongside the ball mill operator. Neither man was using a safety belt or line which were reported available near the entrance to the bin. In the course of working the material down into the feeder draw-down zone, a bank of muck suddenly released from the side catching Daw around the legs to a depth from which he could not work loose. The ball mill operator wanted to go and stop the conveyor which would stop the draw-down, but Daw pleaded that he stay. In only a few minutes the situation became critical and the ball mill operator rushed out, stopped the conveyor and summoned help. When he returned Daw had already disappeared from view in the draw-down. A crew of men arrived, saw the victim's hand and began to dig. When these efforts became futile, the rescue was made by sawing the side out of the feeder slot. Both first aid and medical aid failed to revive the victim.

Several recommendations were made and carried out, immediately following the accident.

1. A formal procedure for working in the bins has been prepared, and personnel instructed.
2. The entrance has been relocated. The entrance door is equipped with a padlock to which only the mill superintendent and mill foreman have the keys. Safety belts and life lines are located at the entrance.
3. The ladder has been replaced with a steel hooped ladder.
4. Cable rings have been installed encircling the inner perimeter of the bin for more convenient securing of the life lines.
5. Open ended drums have been placed inside the bin slung on ropes above the feeders.
6. Additional lighting has been installed.
7. Two conveyor control switches have been installed. One is permanently fixed outside the bin, and the other is portable and can be taken into the bin by the crew. If trouble develops the conveyor can be stopped instantaneously.

At the inquest held in Kamloops on November, 5, 1980, the following verdict was given by the jury:

> "We, the Jury, find that Kimberly Cecil Roy Daw, aged 18 years . . . came to his death at 11.20 a.m. September 19, 1980, as a result of falling into the feeder of a fine ore hopper and being buried by the ore at the Dekalb Mine located near Logan Lake, B.C.
>
> ". . . the death of Kimberly Cecil Roy Daw was due to lack of discipline regarding safety procedures for the cleaning of the ore hopper.
>
> "We, the Jury, recommend that the newly established safety procedures set out by the Dekalb Mine are satisfactory for the prevention of accidents in event that further cleanings of the ore hopper are carried out. It is further recommended that the Dekalb Mine place an emphasis on the assurance that all new employees are made aware of and understand the safety regulations of the mill."

*David Avery Evans,** aged 48 years, and married with three children, was fatally injured on October 31 in the Surgenor gravel pit which is situated approximately seven kilometres north of Courtenay on the east side of Highway 19.

On the day of the accident, Evans had agreed to push some small trees (brush) and topsoil off the sand and gravel on the south side of the pit area for Mr. Surgenor in return for Surgenor's delivery of a few loads of sandy material to Evans' property, which is just north of Surgenor's pit.

According to Surgenor, Evans had pushed most of the brush and topsoil away and was attempting to push down the pit wall from the south when the accident occurred. According to Surgenor, Evans had made only one pass with the blade of the D-6 Cat down and had stopped at the pit rim. Surgenor stated that Evans seemed to be trying to shift the transmission into reverse when the machine jumped ahead about 25 centimetres, then it lurched forward another 25 centimetres and fell blade first over the bank to the pit floor which was about 8 metres below.

Surgenor realized what was happening and called to Evans to jump off the dozer. He was too late. When the dozer landed on the pit floor Evans was pinned in the groin area by the left front canopy post. Surgenor, who was the only person in the area at the time, checked Evans. He was unconscious but groaning. Surgenor ran to his residence and had Mrs. Surgenor call for the ambulance and the Royal Canadian Mounted Police. Surgenor reports that both arrived within 15 minutes. Surgenor related that he tried to burn the canopy post off which was pinning Evans to the pit floor but was unsuccessful.

An R.C.M.P. constable and the ambulance personnel, with the help of Surgenor, were able to free Evans. He was dispatched to hospital in Comox but was pronounced dead on arrival. According to the R.C.M.P. no inquest is planned to investigate the death of David Avery Evans.

This tractor was not equipped with an approved roll-over protective structure.

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* This accident was not recorded as occurring to an individual employed in the mining industry.

DANGEROUS AND UNUSUAL OCCURRENCES, 1975–1980

Section 9 of the *Mines Regulation Act* and section 10 of the *Coal Mines Regulation Act* require that all dangerous and/or unusual occurrences, whether an actual injury occurred or not, at any mining operation be reported to the Inspector within 24 hours of their happening. It is established that the detailed study of such occurrences and the wide dissemination of information about the causes can help to reduce future accidents. Consequently the Branch attempts to study and disseminate the information as widely as possible.

The statistics concerning these occurrences are tabulated below, by year, for the 1975–80 period and each occurrence is described in some detail in condensed form.

The classification of the incidents is necessarily somewhat arbitrary. In the case of underground mines the incidents were classified where possible as to whether they actually happened above or below ground.

The greatest number of incidents by a significant margin is the Vehicle and Mobile Equipment Operation on the Surface. These incidents include causes such as failure of equipment, indicating in some cases a lack of maintenance or inspection; human error indicating in some cases lack of experience or training, lack of attention on the part of the operator, falling asleep, use of alcohol or drugs, etc.

A large percentage of the Fires reported were due to oil soaked rags being left in proximity to welding operations, on vehicle exhaust manifold, etc.

Most of the incidents involving explosives appear to be due to failure to observe proper procedures such as guarding, the incorrect handling of bootlegs, etc.

A significant number of the Caught in Machinery category involved conveyor belts.

The Electrical Failure or Misuse category included many cases of equipment contacting overhead power lines.

Failure of Equipment includes a wide miscellany of incidents, some of these involving an apparent lack of maintenance.

Falls of Ground indicate in some cases that close attention should be paid to the usual warning signs which precede a significant slide.

The Hoisting incidents in many cases indicate a need for training in the use of hoisting equipment and rigging.

The Train or Locomotive incidents are largely due to operator error or in some cases failure of equipment or improper maintenance.

DANGEROUS OR UNUSUAL OCCURRENCES
TABULATION

Nature	1975		1976		1977		1978		1979		1980		Totals	
	U/G	Sur.	U/G	Sur.	U/G	Sur.	U/G	Sur.	U/G	Sur.	U/G	Sur.	U/G	Sur.
Vehicle and Mobile Equipment Operation	5	54	3	64	2	74	1	57	2	55	2	55	15	359
Fires	8	20	7	32	6	18	2	6	8	8	3	13	34	97
Explosives Handling and Use	4	11	5	6	8	8	3	5	7	6	2	4	29	40
Caught in Machinery	6	7	3	4	1	2		6		11		3	10	33
Electrical Failures or Misuses	1	10	3	7	3	10	1	8	1	8	1	9	10	52
Failure of Equipment	2	4	5	16		8	1	11	1	8	1	5	10	52
Falls of Ground	1	6	4	16	4	6	7	4	2	4	4	4	22	40
Falls of Persons						4		1		2	1	3	1	10
Hoisting	2	2	2	5	1	5	3	3		6	2	10	10	31
Propane Storage and Use	2	1				1				1		3	2	6
Stockpile Collapse		1				2		3		8		4		18
Train or Locomotive	4	1	7	1	10		5	1	3		2	1	31	4
Ventilation Interruption	2		4	1	4		4		1		1		16	1
Mishandling of Chemicals and Pressure Vessels	1	1	1	3			2	3		3		6	4	16
Sabotage and Theft			1	4		1				1			1	6
Drilling					1							2	1	2
Methane					1		2						3	
Natural Gas								1				1		2
Miscellaneous		5		6		5				5		2		23
Total Reported	38	123	45	165	41	144	31	109	25	126	19	125	199	792
	161		210		185		140		151		144		991	

Note: U/G = underground.

Dangerous Occurrences, 1975

On January 1st a small fire occurred in a build-up of sulphide concentrate in the dryer discharge hood at the concentrator of an open-pit mining operation.

On January 3rd a small fire occurred in the electric wiring of a radio in a truck at an open-pit mine.

On January 5th a front-end loader ran away partially out of control down a ramp into an open pit where it came to rest against a muckpile. The investigation revealed that the driver stopped the loader when he saw a truck across the road below him. When he stopped, the engine stalled, and as it would not start his supervisor went to the shop for a mechanic, while he remained with the loader. The parking brake was set and the bucket lowered to the ground. The vehicle commenced to roll forward even though the operator applied the service brake and the auxiliary steering he was unable to override the skidding bucket. An investigation indicated that the parking brake was unserviceable but that the service brake and auxiliary steering were both functional. It was learned that the operator and the supervisor were both aware of the unserviceability of the parking brake and that the operator had spent the accumulator supply for the service brakes by too frequent applications.

On January 5th at an open-pit mining operation a grader, while grading snow off a road, caught its blade on a rock or frozen berm at the edge of the road. This act immediately swung the grader around so that it hung over the bank, being suspended by the grader blade.

On January 7th while four workmen were making repairs in a mine shaft the hoist man, in error, moved the skip and counter balance through the section of the shaft where the work was being done. The hoist man admitted that through drowsiness he mistook a telephone signal for a hoisting signal and moved the conveyance. The workmen managed to avoid both the counterweight and skip when they moved past them. In order to prevent a recurrence, an approved lockout device will be installed on the hoist controls and hoist operating procedures are being changed.

On January 8th a collision occurred between a garbage truck and ½-ton pick-up at the campsite of an underground mine. No one was injured but extensive damage was done to the vehicles. The accident was caused by the pick-up being driven too fast on an icy road.

On January 20th a crusherman at the concentrator of an underground mine operation suffered injuries to his right hand and arm when caught in the tail pulley of a conveyor belt. Contrary to operating instructions the workman was applying belt dressing with a stick which caught in the pulley and drew in his arm. The workman was working on the opposite side of the belt to the trip wire and was performing acts contrary to safe operating procedures.

On January 12th a scooptram operator at an underground mine reported seeing a small explosion occur in a muckpile as he was backing the scooptram away from it. An investigation uncovered a small piece of powder in which an old cap was inserted. This material was destroyed and it was presumed the explosion occurred in other misfired powder in the muck.

On January 14th the driver of a ¾-ton pick-up truck was not injured but extensive damage was done to the truck when it went out of control, skidded off the road, rolled and came to rest about 50 feet from the road. The truck was being driven too fast for the condition of the road which leads to the open-pit mine.

On January 16th the ventilation and compressed air supply to an underground mine was cut off when a transformer malfunctioned. It was determined that terminals within one of the main transformer cases had arced and the contact was lost.

On January 21st a suspected short circuit was believed to have caused a fire in the wiring harness near the battery under the seat in an open-pit road grader. An unsuccessful attempt was made to put out the fire, using extinguishers. Eventually the fire was smothered by burying the grader in snow. It was recommended that, in addition to a larger fire extinguisher, an automatic fire suppression system should be installed in the vehicle. It was also recommended that hydraulic and fuel lines should be replaced as soon as leaks are noticed.

On January 30th during a normal blasting operation at an open-pit mine, two rocks, one about 30 pounds weight and the other or 40 pounds weight travelled about a half mile from the blast area to strike two buildings at a construction site situated on the far side of an intervening ridge between the pit and the construction site. Improved safety procedures now require that all personnel in the area must take protection in designated blasting stations during blasting operations.

On January 30th a collision occurred between two overhead cranes mounted in the concentrator building at an open-pit mine. Some damage was caused to guard rails and floor gratings but no person was injured. The incident was attributed to operator inattention. To prevent a recurrence, a 5-foot long jib-mounted limit switch has been mounted on one crane and will cut the power from the travel motors.

On January 31st a workman was standing in the bucket of a scooptram for the purpose of rehanging a ventilating fan. While in this position the operator of the scooptram raised the bucket to support the fan which was attached by only one support chain. As the bucket obscured the operator's view, he could not see its position relative to the fan. Although two workmen both shouted and signalled to the operator to stop lifting, he continued to do so until the fan contacted the ventilation pipe. The fan dislodged from its supporting chain, fell and struck the workman, breaking his nose and causing facial lacerations. The supervisor, who met the injured man, had the injured man directed to the underground first aid room and then to the surface before the underground first aid man reported there. The injured man rode to the surface on the train, walked to the first aid room for treatment, was driven to the doctor in Stewart and subsequently flown to Prince Rupert for treatment. The accident was attributed to inattention by the operator of the scooptram and it would appear that an unnecessary delay occurred in providing first aid services for the injured man.

On January 31st at an open-pit truck repair bay sparks produced when welding the bearing of a blower were blown into a solvent tank, causing an immediate flash fire. The fire was immediately extinguished without incident.

On February 1st at the repair shops of an open-pit mining operation a small fire occurred in some burlap sacks lying on the floor. The fire was caused by air arcing during welding operations. No damage was done but the shop area underwent improved housekeeping after the fire.

On February 3rd a fire occurred in the rubber lining of a trommel discharge chute in the concentrator at an open-pit mining operation. The fire was caused by the rubber being ignited by hot sparks during a welding operation. Some inadequacies in the fire control system were disclosed during the extinguishing of the fire and new combat procedures have been adopted and new equipment installed.

On February 7th a grader at an open-pit mining operation ran into a slow moving haulage truck, striking it on the driver's blind side. The grader skidded under the right front tire of the truck, which crushed the left front wheel of the grader. The accident was attributed to driver error on the part of the grader operator as all vehicle operators have been instructed not to approach the haulage trucks from their blind side.

On February 9th a small fire occurred in the grease and spilled fuel on the floor of a repair bay in the vehicle maintenance shop at an open-pit mine. The fire was caused by hot sparks resulting from a welding operation on a large truck.

On February 12th a mechanic working at the head pulley of a conveyor at the crushing plant of an underground mine sustained a broken right shoulder, a severed finger tip on his right hand, and several cracked ribs when his hand was caught between the belt and pulley. The conveyor had been stopped but the injured man neglected to lock out the switch which operated the pulley driven motor and an electrician making fuse checks at the switch started the conveyor, being unaware of any men working on it.

On February 13th a near collision occurred at the waste dump of an open-pit operation when the driver of one of three large haulage trucks failed to respond to his directional signal from the dump supervisor and pulled out on the signal to another operator.

On February 15th a fire occurred on a power shovel at an open pit when the accumulated grease under the hoist drum was ignited by sparks produced during a cable cutting operation.

On February 16th there was a serious deformation of various structural members of the north facing roof of the A-frame covering the fine ore bin at an open-pit mine. The cause of the deformation was attributed to an overload buildup of snow and dust on the roof. The dust source was from atmospheric emissions of dust from the stack of the crusher dust control system.

On February 18th the brow of a frozen ore stockpile at an underground mine collapsed and fell onto and extensively damaged the front-end loader working on the stockpile. The stockpile was frozen during the winter but, as the temperature had risen above freezing, the frost was leaving.

On February 20th a minor fire occurred in an underground locomotive when a faulty terminal short-circuited during a battery charging operation.

On February 23rd a dozer while working on an ore surge pile at an open-pit operation ran backward down the surge pile, across a 42-foot wide flat and down an embankment to where it struck a conveyor tunnel and rolled onto its side. An examination indicated the safety brakes were defective in that excessive play existed in the linkage owing to the use of an unsuitable bolt as a pin connector between the safety cylinder and the foot-brake linkage.

On February 24th a truck was being driven up a decline in an underground mine when suddenly the lights went out, the engine stalled and the vehicle rolled back about 35 feet to strike a pillar as the foot brake did not function. An investigation indicated a piece of rag had caught around the drive shaft universal joint and, as it wound up, it wrapped around the electric wiring, the fuel line and the air foot-pedal lines, breaking all of them. It was found that the emergency braking system was operable but had not been used.

On February 25th a rotary drill slid off an open-pit bench and fell to the road about 20 feet below. It was learned the drill had positioned itself at the edge of the bench and had levelled up with the jacks. As the operator was about to lower a drill rod the off side jack settled because, as it was later learned, it had been placed in snow and not on solid ground.

On February 28th a front-end loader operator employed feeding concentrate to the draw-down point to a reclaim tunnel at the loading dock of an underground mining operation was seriously injured when caught between the reclaim conveyor belt and tail pulley, the nip point of which was unguarded. The workman had gone to investigate why the conveyor belt was slipping, and possibly, due to unsure footing in a poorly lit area, he fell onto the belt. He was on the off side of the pulley from the normal walkway and the pull cord stopping device. The foreman who was also present immediately pulled the cord, stopped the conveyor and then cut the belt with his knife to free the injured man, whose arm was already around the pulley. The area has since been cleaned of ice, concentrate and debris, the tail pulley area guarded, the stop cord extended and lighting improved.

On March 1st the driver of a coal haulage truck at an open-pit mine sustained a fractured leg and dislocated ankle when he jumped out of the truck he was driving. Shortly after midnight he was dumping a load of coal on a stockpile and, as it was not spilling, he moved forward quickly. This action caused the front end of the truck to lift off the ground. As it was dark he could not see what had happened but believed the ground to be sliding out under the truck so jumped out. He was nearly run over by his truck, which continued forward until it ran into a pile of coal.

On March 2nd a Terex loader was being driven down a road inclined at 9% to a crushed rockpile during a snowstorm at an open-pit mine when the loader veered to the right and ran off the road. The driver said the vehicle did not respond to steering or brakes even though he pushed the brake pedal to the floor. The investigation showed the brakes to have been in good working order and that no skid marks were on the road where the loader had travelled. It is possible tire chains would have provided better traction and it is the intention of management to give future loader operators formal driving training.

On March 3rd the operator of a tractor at an open-pit received burns to his right hand and arm as a result of the flames produced by an ignition of hydraulic fluid on the exhaust pipe of the tractor. The right blade-lift cylinder-feeder hose developed a leak and the spraying hydraulic oil was blown back onto the exhaust pipe by the cooling fan. In addition to being burned, the operator injured his hip on jumping off the tractor. Modifications were made to the tractor hood and side covers to give adequate clearance for the hoses so that they will not wear through by contact.

On March 6th a large fall of ground occurred on the main decline into an underground mine. Approximately 100 tons of rock fell in an area of fractured ground which had been previously supported by bolting, strapping and screening. On the previous shift water was noted to be dripping where the cave occurred, which was about 400 feet back from the working face.

On March 6th an electrician at an open-pit mining operation received facial flash burns from an arc flash when the shank of the screwdriver he was using came into contact with an energized switch. An investigation indicated the insulating guard on the switch had been incorrectly installed. Instructions were issued to ensure that switches are checked before installation and that insulated screwdrivers must be used.

On March 8th a crusher operator at an open-pit mine was trapped in the mouth of a gyratory crusher which he had entered in order to move a muck hangup. As the hydraulic grapple and the crane were inoperable at that time, he put on his safety belt, secured the lifeline and climbed down into the crusher. The muck slumped and he was trapped in it. It took an hour to release him. Although the committee reviewing the incident concluded that a crusher operator should have the right of determining whether it was safe or not to enter a crusher, it is the belief of this department that the practice of entering is not a safe procedure.

On March 12th at an open-pit mine a loaded 100-ton truck ran out of control, struck a sand pile in the middle of the road, then climbed a grader windrow of sand and gravel and finally stopped about 40 feet from the road. Although the driver claimed he experienced steering difficulties he made no attempt to use the emergency steering with which the truck was equipped. An investigation indicated that the left front suspension was badly damaged, the left front steering-cylinder piston rod was broken and the hydraulic steering pump housing was cracked during the mishap. It is believed the driver fell asleep and the damages occurred as a result of the truck being out of control.

On March 17th at the crushing plant of an underground mining operation a workman had his left hand and arm caught between a conveyor belt and an impact idler pulley. The workman was cleaning between two idlers when the short handled wash brush he was using caught in the nip point. All workmen have been advised once more of the conveyor belt safety operational rules and the short handled brushes have been removed.

On March 18th a fire occurred in the left rear brakes of an open-pit large haulage truck. It was not determined if the cause of the fire was because of mechanical malfunction or from operator's driving habits.

On March 19th the front wheel spindle broke on the driver's side of a large haulage truck. As this type of incident has occurred elsewhere, it is recommended that a regular program of non-destructive testing be carried out on all wheel spindles. Meanwhile, it is the operator's intention to have a metallurgical test made on the broken components as they and other spindles have developed fatigue cracks.

On March 23rd the operator of a P & H Model 1400 shovel sustained a fractured leg when the shovel was struck by a block of frozen ore which broke away from the stockpile he was removing. The shovel was extensively damaged, including the operator's cab which was practically demolished. The shovel was working within its operating height, however, because of the shell-like development of the muckpile owing to the frost, it is recommended that special attention be given to releasing these crust developments while the piles are being removed. Another recommendation was made to endeavour to get the manufacturer to locate the operator's cab at a higher elevation on the shovel.

On March 23rd at an open-pit mining operation a 120-ton haulage truck ran over a one-ton service truck parked about 40 feet to the right and ahead of the haulage truck. While the haulage truck had been stopped for on-the-spot repairs, the service truck had broken down also and the driver had gone to get a vehicle to tow his truck back to the shop. Meanwhile, when the repairs had been completed on the haulage truck, the driver started up and ran into the service truck. Although the driver of the service truck should have warned the driver of the haulage truck that the broken down service vehicle was in the blind area, the haulage truck driver was remiss in not walking around his vehicle before starting to move it.

On March 26th a crane of 22-ton hoisting capacity overturned while being unloaded from a low bed trailer. The crane came to rest against a tank drill parked beside the loading ramp. Damage to the crane was negligible but extensive damage was done to the radiator and fan of the drill. The crane hung on the low bed while attempting to climb up the earthen ramp at which it was being unloaded. The crane hook was attached to a tree upslope from the unit, in order to release the trailer. The trailer came free but the crane overturned during the action. It is believed that rear stabilizers sank in the soft ground, thus making the crane's footing unstable.

On March 26th the right front wheel fell off a Ford 4-wheel drive vehicle at an open-pit mine when it was descending a hill and travelling at about 12 miles per hour. An investigation showed that the bolts holding the brake drum had loosened and sheared. Large bolt holes were drilled and larger bolts were used.

On March 31st subsequent to a blast at an open-pit mine, fly rock struck a drill in which men were located. The drill was about 600 feet away from and 160 feet below the blasting area. The loading and guarding of blasts is now under review.

On April 2nd an electrician at an open-pit mine received arc-flash injuries to his eyes when he attempted to replace a pin in a pothead connector on a shovel power cable while checking the pilot-wire circuit. The investigation indicated an error in communication occurred between the electrician and his partner, who had re-energized the cable before the check had been completed. If proper lockout procedures had been observed the incident would not have occurred.

On April 3rd a fire occurred in an abandoned switch box in a raise near a slusher drift in an underground mine. The fire involved the bakelite insulation on a 100-ampere breaker in a 550-volt circuit. The switch involved was of a type which had proved unsatisfactory in blasting areas so had been replaced with an improved model. The old switch had not been removed, nor was the power disconnected, and it was indeed fortunate that the individual pulling the energized cable from the box was not severely shocked.

On April 8th a wedge-type failure involving 4,000 to 5,000 tons of waste rock occurred on one of the benches at an open-pit mining operation. Because of inadequate width, the catchment below was unable to retain the caving material which continued to the next lower catchment. The falling material struck and extensively damaged a bulldozer working on the lower catchment but the operator escaped uninjured. An investigation indicated poor mining controls (e.g. over-blasting) permitted the development of narrower than designed width (50-foot) benches and that the wedge failure may have been abetted by run-off water entering the joint planes.

On April 8th a man train was peppered with small pieces of rock ejected by a blast immediately under the footwall of a raise adjacent to the drift in which the train was waiting. The blasting was being done in a subdrift under the raise. Fortunately no one was injured but the shiftboss and workman involved were remiss in not ensuring that the blasting area was properly guarded.

On April 14th a workman at a limestone quarry sustained a compound fracture of the right forearm and a dislocation of his right wrist when he stumbled into and grasped the rotating drill rod of an air-trac drill. The glove which the workman was wearing was caught by the rotating movement. The drill operator immediately stopped the drill and put it into reverse rotation to free the injured man.

On April 18th at an underground crushing installation the "full bin" warning device failed to function with the resulting spillage stopping the belt movement. Friction caused the non-flammable belt to smolder. This caused the area to fill with dense smoke, which reduced visibility to zero for the men wearing the type "N" masks while searching for the source of the smoke.

On April 19th a loaded 100-ton Lectra-haul truck lost its dynamic braking while enroute to the crusher and had to use a runaway lane to stop. The investigation indicated the alternator belt was missing and the batteries were dead, thus removing the power to operate the dynamic brakes. The vehicle operator had failed to note that the ammeter was not functioning.

On April 22nd a heavy-duty mechanic at an open-pit mine sustained an open, depressed frontal, skull fracture and a punctured chest wound when struck by shrapnel from an exploding nitrogen pressure regulator. The injured man intended to use the nitrogen to purge the rear suspension cylinder on a Haulpak truck. He had just turned on the main valve when the explosion occurred. An investigation of the incident indicated the cylinder pressure gauge ruptured, thus permitting the high pressure within the cylinder to be transferred to the low pressure side of the regulator assembly where the atmospheric bleed valve ruptured. The cylinder then fell over and the regulator assembly stem broke at its connection to the cylinder. The incident points out the need for periodic inspections of compressed-gas bottle-valve assemblies and also the need to ensure that only fittings rated for the job are used.

On April 23rd a large drill was being moved at an open-pit mine when the drill mast contacted an overhead 4160-volt transmission line. The drill was being moved down a ramp. The operator was unable to see the powerline and his helper, who was walking backward down the ramp and guiding the drill's progress, also failed to notice the powerline before the drill mast contacted it. A nearby workman signalled the drill operator to stop the drill and the operator, wanting to determine why it was necessary to stop, jumped off the drill. On seeing the mast against the power-line, he attempted to climb back on the drill but received a severe electric shock from which he quickly recovered. The power was cut off and the drill moved away from the line. Both the supervisor and the drill crew should have checked out the route of travel before starting.

On April 24th a skiptender in an underground mine sustained a fractured left forearm when the sleeve cuff of his coveralls caught between a moving conveyor belt and one of the rollers. He was attempting to clean a conveyor table with the aid of a shovel when his clothes were caught at the nip point.

On April 26th a utility operator working in an underground crushing chamber sustained a crushed right arm and torn tendons both in his arm and shoulder when he was caught between a conveyor belt and its head pulley. The workman had opened a gate in the head pulley guard and was applying non-slipping material to the belt when his hand was caught. As a result of the incident the mine operator has modified the conveyor trip cord by extending it to the head pulley. The mine operator is also investigating the possibility of attaching a conveyor stop to the gate.

On April 28th a surface subsidence was reported to have occurred close to a public road in an area where previous caving has occurred over shallow underground workings.

On April 29th an underground miner suffered a lacerated scalp wound and a dislocated shoulder when the slusher he was operating tipped and threw him against the wall of a stope. The cause of the accident was attributed to a side pull on the slusher when its pull-cable to the scraper jumped out of an alignment block. The installation has been improved by securing the slusher with two anchors and chains.

On May 5th during a snowstorm at an open-pit mine a grader was scraping snow while proceeding up a ramp. The grader was being followed in turn by a crew bus and a sand truck. On reaching the top of the ramp the grader wheels spun out and, when the grading blade was lifted, the vehicle commenced sliding backward down the ramp. The bus was stopped and it, too, commenced sliding backward and struck the sand truck waiting at the bottom of the ramp. No persons were injured but a considerable amount of damage was done to the bus and truck.

On May 7th while mechanics were preparing to drop-test a combined cage-skip unit in a shaft, the upper left brake linkage rod snapped as the left brake was being set. At that time both drum clutches were engaged and the right brake had been set. The linkage rod snapped at its innermost thread on its upper end. The remaining linkage rods and their newly made replacements were all subjected to non-destructive tests and were found to be free of faults.

On May 8th a scooptram jack-knifed and rolled over on the footwall of a stope having a grade of 15 per cent. While cleaning the footwall the operator backed the scooptram up the slope but the wheels spun out on the smooth wet surface. The vehicle then slid sideways, jack-knifed and rolled over without injuring the operator.

On May 8th at an open-pit mine the brake assembly, brake drum and thrustor assembly at the old or No. 1 tramline terminal were completely destroyed during an overspeed runaway. The tramline operator received several minor injuries while extensive damage was done to No. 2 tramline station, to buckets, cables and towers. The operator endeavoured to apply the brakes as soon as the runaway occurred but the brakes disintegrated. The actual cause of failure was not positively determined but it was believed due to metal fatigue.

On May 8th an electrician repairman at an open-pit mine received minor injuries as a result of an electric power flashover which occurred when he was using a volt-meter to check the feed side of a fused disconnect switch. The investigation failed to conclusively determine the cause. However, substantial recommendations are to be adopted to prevent a recurrence.

On May 12th the driver of a 50-ton truck was not injured when the vehicle rolled over, subsequent to high centering on a muddy section of a mine road.

On May 14th a jumbo operator in an underground coal mine sustained such severe shatter injuries to his right foot and ankle that it was necessary to amputate his leg below the knee after being exposed to a blast which occurred when a lifter hole was being drilled. The steel used in the hole apparently drilled remnants of explosives left in a bootleg hole, subsequent to a blasting operation. Although the drift face had been washed down and examined for missed holes, it was apparent that this particular hole had been missed.

On the afternoon of May 15 three avalanches occurred on a road to an underground coal mine during a 3-hour period. The slides occurred during the mild weather accompanied by rain. The mine operator, being aware of an avalanche hazard on the road, had adopted monitoring procedures and had observed the necessary safety precautions. While plowing out the road the bulldozer operator was under constant observation and carried a radio rescue beacon.

On May 15th at an open-pit mine a shop fork-lift overturned when it ran up an embankment after stalling while ascending a ramp. Instructions were issued restricting the field of operation of the forklifts to the shop areas only.

On May 26th at an open-pit mine an improperly assembled front wheel suspension on a 100-ton truck was the cause of a steering failure, during which time the truck ran off a road and into a ditch.

On May 28th a fire occurred on a Marion shovel at an open-pit mine when sparks from a welding operation fell onto some wood and gravel coated with grease and solvent on the shovel platform. The fire was extinguished after minor damage was caused to the vehicle.

On June 4th at an open-pit mine a digital volt-ohm meter exploded when a workman attempted to test a 575-volt AC circuit. It was determined the workman had not used the correct operating range for the instrument.

On June 5th the driver of a 100-ton truck momentarily dozed off to sleep while returning to the loading shovel. During that instant the truck ran off the road and into a ditch on the right side of the road. No damage was done to the truck nor was the driver injured. The investigation indicated the driver was working overtime because another driver had quit three shifts previously. This Department considers this overtime practice a misuse of the exemption permitted under Sec. 19 (2) (b) of the *Mines Regulation Act*.

On June 10th a 100-ton haulage truck struck a large rock after veering off an open-pit haulage road. The driver was uninjured but approximately $100,000 damage was done to the truck. The incident occurred at 3:10 a.m. when the driver attempted to pick up his radio which had fallen off the dashboard and onto the floor. He admitted being drowsy and, when reaching to pick up the radio, had accidentally knocked the engine switch into the "off" position and the vehicle then went out of control. The management will supply utility boxes within each cab for the storage of loose objects. They have also offered to securely attach private AM-FM radios. They have also requested drivers to report to the foreman when they begin to feel drowsy, so that the problem can be dealt with at that time.

On June 10th an open-pit mine employee reported for first aid treatment for facial burns. On investigation it was learned that he and three other employees had been charging plastic bags and 5-gallon tins with oxygen and acetylene, and then by various means igniting the gas mixture to cause detonation. The four employees were dismissed.

On June 11th a flat-deck truck carrying approximately 50 bags of AN/FO explosives backed over a 40-foot high bench when preparing to load holes. No person was injured and the truck slowly slid to the lower bench. The truck driver failed to follow the directions of the person guiding him. Operating procedures have been revised, requiring vehicles to be kept clear of the berm edges.

On June 18th fire damage amounting to about $4,000 was caused to the rear brake assemblies of both wheels of a 100-ton haulage truck. The fire was attributed to a leaking air nipple in the rear brake system. The leak caused excess friction on the brake and started a fire.

On June 19th an inexperienced driver of an empty 85-ton ore truck permitted the vehicle to run out of control when descending a haulage ramp. He failed to actuate the service, parking or maxi brakes while descending the grade. The vehicle was halted after running up an adverse grade but, before doing so, collided with and destroyed a cable arch, broke the shovel power cable in two places and damaged the truck air cleaner.

On June 23rd an open-pit mine road grader backed over the edge of a road and made a ¾ roll before stopping on a road 15 feet below the first. The grader was not equipped with roll-over protection and the cab was extensively damaged but the driver was uninjured. Operational procedures have been changed to require that the grading done on steep narrow roads be done downgrade and, if possible, under the direction of another person.

On June 25th a P & H 1600 shovel rolled out of control down an open-pit ramp when the brakes failed to hold when another length of trailing cable was being added. On being checked by the mechanics the runaway was repeated. After the electric solenoid in the brake circuitry was replaced the brake operated in a satisfactory manner.

On June 25th the front right tire of a 170-ton Lectra Haul truck exploded while the truck was being loaded at the shovel. The explosion showered rock against the foot and main observation windows, both of which were broken. The tire, which was only 35 per cent worn, contained a 30-inch long incision, which was attributed to having been cut on a sharp rock.

On June 25th the driver of a loaded 100-ton truck ran off the road and into a ditch at the side of the crusher haul road. The driver stated that the glare of the bright lights of an approaching truck momentarily blinded him. When this happened, he unknowingly ran onto the soft shoulder on the road and thence into the ditch. There were no injuries or damages resulting from the incident and it is believed the lights of the approaching vehicle were out of alignment.

On June 26th a brake failure occurred on an underground train while a running brake test was being made. An emergency stop was initiated by the operator of the trailing locomotive. The failure was attributed to a faulty brake valve assembly, which was replaced.

On June 27th at an open-pit mining operation a crane of 14-ton capacity was used to lift a 5-ton bunkhouse and, when the load was being placed about one foot above its final position, the boom pivot hinge snapped. The bunkhouse dropped to the ground and the boom fell on top of the of the building, which it destroyed. The pivot hinge and mount were rebuilt with a stronger design. The completed unit was tested and certified structurally sound.

On June 28th a flash flood caused a small creek to overflow its banks and enter the original tailings' impoundment of a closed underground mine. The flood waters broached the impounding rock dyke in three places, thus permitting an undetermined amount of tailings to run down into the main drainage channel. In addition the flooding caused extensive damage to the protection dyke located between the main river and the main tailings impoundment. As soon as road conditions permit and equipment is available, it is intended to repair the damaged dykes.

On July 2nd a driver trainer fortunately escaped injury during a blasting operation in an open-pit by taking refuge in the bucket of a shovel near the blast area. The driver trainer had posted himself near the blast area in order to watch a new driver operating between the shovel and the dump. The shift foreman was unaware of the trainer's presence and believed the area to be clear. When the siren sounded one minute before the blast, the driver trainer ran into the bucket, which faced away from the blast. This incident was the result of poor communication between the two supervisors.

On July 7th the improper pressure setting of an incorrectly located pressure protection switch caused the service brakes of a 100-ton truck to drag and catch fire. The damage done necessitated the replacement of the calipers, hydraulic and air hoses, brake discs and electric wiring.

On July 7th a shiftboss at an underground mine escaped serious injury when pinned between two personnel carriers as he was connecting a tow chain between them. One carrier had stalled and the other was being backed down to tow the stalled vehicle when the foot of the driver of the towing vehicle slipped off the brake pedal, thus permitting the carrier to roll back down into the stationary carrier. The vehicles should not have been connected until both were halted.

On July 8th a premature blast occurred at an open-pit mining operation, subsequent to the initiation of a large blasting operation. Two blasters had connected 116 Powerfrac forcite-loaded holes into three lines utilizing millisecond delay caps. They had cleared the area of all other personnel, observed all necessary procedures and had ignited the round. Approximately 15 seconds after the blaster ignited the round and, as he was walking back to the pickup truck, which was about 55 feet from the nearest hole, the holes commenced to explode. One blaster was in the cab and the other dropped along side the pickup on the lee side. The man outside received a slightly bruised hand, while the truck was spattered with mud and slightly dented with flying rock. As loose rocks had previously been noticed rolling down the face of the bench above the blast site, it is presumed a rock had struck and initiated a delay detonator or a primacord line between detonators. It was additionally proposed that the detonation may have been caused by the burning end of the tightly curled tape igniting fuse coming into contact with a delay detonator or the primacord.

On July 9th an unloaded 100-ton haulage truck went out of control and struck a pole-type cable arch on a turn at the bottom of a ramp leading into an open-pit. The driver reported he had lost steering control but no steering defects were found. It is believed the vehicle was travelling too fast on the muddy road surface and it had skidded and thus did not respond to steering control.

On July 9th the left rear brake assembly of a 100-ton haulage truck caught fire owing to the brakes dragging.

On July 10th a fire occurred in toweling being used as an insulator between a battery box and the battery posts under the seat of a dozer at an open-pit mine. Improper materials were being used for insulation.

On July 12th an employee in the primary concentrator plant at an open-pit mine sustained a cut face, a fractured jaw and two broken teeth when struck in the face with a metal bar he was using to release a hung-up chute. The hung-up material broke loose, struck the bar and caused it to flip up into the workman's face. This frequently occurring type of accident could be almost completely eliminated if proper barring procedures were being observed.

On July 14th the base of a 100-pound propane-gas cylinder was ruptured by an explosion of propane gas. The cylinder travelled almost 250 feet vertically before falling back to the ground. The base of the tank was found to be severely rusted and thin. Another tank was found to have pin hole leaks in its base so the propane was vented off.

On July 16 a ¾-ton pickup was damaged at the rear by a 100-ton haulage truck which backed over the pickup while being directed into a place by a dump supervisor. The dump supervisor had parked the pickup in the centre of an area on the waste dump where a lift was being placed. One truck had been spotted for dumping in such a position that, when the second truck was being spotted, there was inadequate clearance between it and the pickup, which was struck.

On July 19th an ore train comprising two 35-ton electric locomotives, sixteen 50-ton loaded ore cars and an empty man-car failed to stop at the loading pocket of an underground mine, and, although the brakes had been dynamited by the motorman of the trailing locomotive, the train continued on into the end of the tail drift at a speed of between 5 and 10 miles per hour. The cab of the lead locomotive was crushed between the front of the first ore car and the face of the drift, a space of about 5 feet, while the rest of the locomotive was driven up over the top of the ore car with part of the chassis doubled back on itself. The motorman was trapped in the remains of the cab which, miraculously, contained just sufficient space for him. His only injuries were bruises. The investigation of the incident indicated that the motorman had made the usual tests on the run, although on this and previous shifts, certain irregularities had been experienced in the braking actions. The investigation concluded that it would appear most likely that the accident resulted from malfunctioning brake valve equipment on the lead locomotive. This malfunction was attributed to inadequate maintenance and the poor design of the D valve (deadman) circuit. In addition, the substandard condition of more than 50 per cent of the brakes on the ore and man-cars at the time of the accident and the lack of an emergency retarding system in the final section of the tail tunnel were accessory factors in failing to mitigate this accident. While there was no direct evidence that the lead motorman was not alert at the time of the accident, this possibility could not be entirely ruled out.

On July 20th at 3:30 a.m. the driver of a loaded 100-ton truck admitted he fell asleep while driving up an open-pit ramp and failed to turn onto the normal haul road. He wakened as the truck was proceeding up the ramp extension where he stopped the truck. He then proceeded to back down the extension but excess speed developed and the truck ran up onto an embankment and rolled over. The driver was not injured.

On July 23rd a fire involving both wheels and wheel motors on a 100-ton truck was caused by friction when the wheel brakes failed to release after an application.

On July 24th an electrician at an open-pit concentrator received arc flash burns to his face, chest, and hands when the probe of the meter he was using touched simultaneously the energized side of a fuse and the door latch of a disconnect switch. The workman was not wearing safety glasses or a face shield, which were available. The company has directed the meter probes be shortened to lessen the risk of grounding.

On July 28th the driver of a Euclid truck failed to examine the area around his vehicle before moving the truck. He backed the truck over the front of a crew cab truck, which was parked about 50 feet behind.

On July 30th a gravel pit crusher operator received head and chest injuries when struck by a 2-foot diameter rock which rolled off a surge pile as he was walking toward the feed conveyor at the surge pile.

On July 31st an open-pit production vehicle slid into a ditch at the edge of a road when the road shoulder collapsed while another vehicle was passing at a narrow section.

On July 31st the hoisting cable on a 10-ton crane snapped through over-loading when inexperienced personnel were using it to lift a heavy load in a concentrator at an open-pit mine.

On August 5th at an open-pit mine the driver of a 3-ton truck managed to safely stop the vehicle after the brakes failed when an air line nipple broke off.

On August 8th a motorman on an underground locomotive received minor injuries when two trains collided underground. The accident was caused when the momentum of a loaded moving 13-car train on a side track pushed the train out into the main track as a load of empty cars was passing.

On August 8th at an open-pit mine the general foreman failed to ensure all personnel had been vacated from the site of a blasting operation prior to initiating the blast. A welder who was working under a bulldozer was left in the blast area but escaped injury by remaining under the cover of the vehicle during the blast.

On August 12th a 75-ton truck was extensively damaged when it rolled over a bank and down about 90 feet to the next bench below. The previous day the truck had run out of fuel and was parked and the wheels were chocked. Because the truck ran out of fuel the brakes dynamited, but the next day the maintenance crew recharged the air cylinders and, in so doing, released the brakes. As the wheel chocks were inadequate, the vehicle rolled over them and over the bank.

On August 13th while working on graveyard shift, the driver of a loaded 120-ton truck fell asleep while descending a ramp leading to the dump at an open-pit mine. The truck ran off into the ditch with no injury to the driver and minimal damage to the truck. The driver was near the end of the shift and was working the first shift following scheduled days off. He failed to report his fatigued condition to the mine shift foreman.

On August 16th a driller was moving a drill into an area where two previously drilled holes had caved and where loading was in progress. As he advanced the drill he noted a primer and some "B-line" detonating cord lying in the path of his equipment so he asked the blaster who was loading holes to remove them. The blaster seized the end of the B-line to which a detonator was attached and whipped it over his shoulder with sufficient force to strike and shatter the windshild of a hole-dewatering truck parked nearby. After investigation the Inspector of Mines suspended the blaster's certificate for a period of two months for committing a dangerous act with explosives.

On August 19th a fire destroyed the contents of a shop and the motor of a compressor at an underground mine. It is suspected the cause of the fire was due to an electrical fault in a welding machine.

On August 20th a scraper operator at an open-pit mine sustained a fractured left tibia when the scraper he was operating approached too close to the edge of a bank which crumbled and failed. The scraper rolled three quarters of a turn down the bank. The scraper was equipped with a roll-over structure and a seat belt but the operator was not wearing the belt.

On August 20th an electric short in the harness wiring of a two-way radio caused a fire in an open-pit production vehicle.

On August 20th an employee at a limestone quarry committed a dangerous act with explosives when he threw a half stick of 2½-by-16-inch dynamite at a moving loaded production truck. The explosive fell under the wheel and was run over. The employee was discharged.

On August 20th dense smoke filled the chamber above an underground crushed ore bin, subsequent to a piece of rebar steel having jammed against a moving conveyor belt. The belt's motion was halted as was that of the drive pulley, too. As the conveyor motor continued to run, the V-belts connecting the motor sheave and drive pulley overheated and smoked. Initially, the crusher operator failed to trip the pull wire and attempted to escape down the smoke path. This incident indicated the necessity to adequately train all employees in the area in proper safety procedures in the event of a fire.

On August 22nd a collision occurred at 6:25 a.m. between two loaded 100-ton trucks at the waste dump of an open-pit mine. One truck was backing to dump its load when the other truck struck it broadside..The driver of the second truck claimed he had dozed off to sleep. It was recommended to the superintendent that vehicle drivers should advise their supervisor when they are aware of being drowsy.

On August 24th a concentrator employee was completely buried by a slough of concentrate in the storage bin while endeavouring to release a hang-up. Apparently an air hose and blow pipe had been left in the bin by someone during the previous shift when they were attempting to bring the concentrate down. Some concentrate was drawn off below at the chute and this exposed the man's head. The concentrate was then shoveled out at the chute and the man escaped through the draw point. He was equipped with a safety belt and rope which was obviously too long for his working position.

On August 26th a carpenter on a construction project at an open-pit mine narrowly escaped serious or fatal injury when a tramline bucket came off the line at an angle station and fell to the ground. The workman had heard a strange sound overhead and on looking up saw the bucket falling on him so jumped out of the way. If it is necessary for any person to walk under the tramline, adequate protection should be provided.

On August 28th a fire of spontaneous origin occurred in a pile of oxidized concentrate in the storage shed. The concentrate fire area had been undisturbed for a relatively long period of time. An attempt will be made to improve the drying of the concentrate, and to endeavour to avoid prolonged storage.

On August 29th a bottom-dump scraper backed into and damaged a ½-ton pickup truck which had parked behind it at an open-pit tailings dam. The ½-ton truck was operated by a supervisor who had stopped when signalled by the scraper operator who was having some difficulty with his equipment. After the supervisor left his vehicle the scraper operator backed into it. The small vehicle was parked in a blind area but the scraper operator should have signalled by horn he was backing and also having stopped his vehicle he should have made an area check before backing.

On August 30th a small fire occurred in the insulation of the charging cables at an underground battery charging station. The fire was caused by an electrical short circuit in the cables between the breaker and the battery box.

On September 4th a short circuit in the electric wiring of a communication radio in a rotary drill caused a fire in the wiring harness.

On September 4th a blaster at an open-pit mine left a part roll of Primacord on an operating drill and then on the following day failed to observe proper blasting procedures by initiating a blast before the area was properly cleared and without waiting for the blasting siren to be sounded. The blaster's blasting certificate was suspended for a period of 60 days.

On September 6th the operator of a drill at an open-pit mine fortunately escaped injury when both pull-down chains broke as the drill steel was being raised at the completion of the drilling. When the chains broke the rotary head and the drill steel fell back to the bottom of the hole.

On September 9th a subcontractor's workman sustained a broken left forearm and a broken left leg when he fell about 40 feet from a moveable hanging scaffold being used to dismantle a shaft head-frame at a closed mine. The accident was attributed to the slipping of the cable through a clamp on the cable sling at the end of the platform. The accident was attributed to inexperienced workmen using unsafe equipment to perform a dangerous task.

On September 10th the driver of a ¾-ton pickup fell asleep while driving up the main road to the open-pit. The vehicle failed to negotiate a turn and was totally destroyed when it ran off the road and down into a creek bed. The driver was not injured. In the interest of the safety of personnel and the prevention of damage to equipment it is recommended that when operators are aware they are becoming drowsy this should be reported to their supervisor in order that a relief operator can be provided.

On September 11th a fire occurred on the main power lead cable where it entered the chassis of an underground locomotive. The fire was started by an arc flash which caused extensive damage to the contractors. The fire was extinguished but the reason for the arcing was not determined.

On September 11th a propane bottle delivered to the camp of an underground mine was found to have a pinhole leak in the side of the bottle. The bottle was removed to a safe area and allowed to drain. This is the second time in one year that substandard bottles have been delivered to mines in this district.

On September 11th two men were about to leave a freight elevator in the surface installations of an underground mine when, as the doors were being opened, the elevator commenced to descend. It was found that the wire gate control limit switch had been damaged and was improperly repaired.

On September 13th a service truck operated by an underground mine rolled over off a public road when the edge of the road caved under the rear wheels of the vehicle. The truck had pulled to the road edge and the operator had got out to assist the driver of another truck when the bank collapsed.

On September 18th a fire occurred in the lower bearing of a secondary screen at the secondary crushing plant of an open-pit mine. The fire was quickly extinguished and was found to have been caused by friction where the seal backing plate was rubbing in the labyrinth seal on the lower drive side bearing.

On September 24th a pickup truck at an open-pit mine was extensively damaged but the driver was uninjured when his vehicle rolled over on one of the mine roads. It was believed the operator was driving at an excess speed as skid marks and track marks were in evidence for a distance of 110 feet on the side rock berm at the road edge. At the point of the accident the road was 62 feet wide, smooth, dry and on a slight up grade.

On September 29th the blasters at an open-pit mine believed a hole they were attempting to load had caved at about 20 feet from the collar. The explosive they inserted was removed and a drill was moved over the hole in an attempt to redrill or ream the hole. Drilling commenced and when the bit was at 40 feet below the collar, pieces of Primacord, Procore III, Primer and fuelled ammonium nitrate were washed up to the surface. Drilling ceased immediately and the drill was removed. The investigation indicated that the blasters had stopped for lunch before the initial loading was completed and, while they were away, the primacord line had apparently slumped into the hole. On returning, they apparently forgot they had done some initial loading and, on recommencing, believed the hole had caved, so requested redrilling or reaming, with the result as above noted. The mine operator issued a directive, requiring that all loaded holes shall be staked to indicate that fact. It was also recommended that, when loading on a hole is started, it be continued until completed, or its unfinished condition be duly marked with adequate signs and the details recorded in the shiftboss' daily report.

On September 30th a dump attendant had her hair singed by a flash fire in a propane heater in the attendant's shack. An investigation indicated that this attendant had tampered with the automatic gas controls in spite of the fact she had been told not to touch them. The incident was not reported for three days at which time the investigators found that one extinguisher in the shack had been discharged and the seal had been broken on another at some time subsequent to the incident of the flash fire. Some charred paper was also noted in the shack.

On October 1st through a breakdown in communications three maintenance personnel were left in the engine room of a shovel while a blasting operation was being carried out about 170 feet from the shovel. A crew working outside the shovel had been removed in accordance with General Rule 66 but the crew inside was not. These men were not injured but blasting procedures are being revised to ensure there will not be any repetition of a like occurrence.

On October 1st a ventilation breakdown of 1½ hour's duration occurred at an underground mine when the high pressure flares in the diesel generators at the main power plant failed to ignite.

On October 6th a 30-inch long rupture occurred in a 30-foot section of 8-inch diameter airline in the underground workings of a mine. No persons were injured and it was recommended that deteriorating pipe be removed from service before it becomes a hazard.

On October 8th two men collapsed while working on the roof of the roaster screen room at an open-pit mining operation. An investigation failed to determine the cause of the incident. The men were wearing filter-type masks protecting from them acid gases and organic vapours. It was suggested that the men were overcome by sulphur dioxide gas but their symptoms were not consistent with those caused by sulphur dioxide. It is also suggested collapse was due to dust and warm air, but tests indicated only a very slightly higher breathing resistance because of dust on the filter face. A third alternative could be an escape of carbon monoxide from some incomplete combustion within the building. New operating procedures have been adopted to avoid a recurrence of this type of incident.

On October 14th the driver of a large haulage truck endeavoured to back his vehicle between two parked trucks. In so doing he backed into and crushed the cab and left door of one of the parked trucks. It was determined there was insufficient room to park between the two stationary vehicles, and that he did not have an unrestricted view of the area over which he was travelling.

On October 15th a mill electrician at an open-pit mine suffered chemical facial burns and a ruptured eardrum when an explosion occurred in the battery on which he was working in the motor control centre room in the mill building. The employee quit his job before a complete investigation was made but it is believed he may have accidentally placed a metallic radar light across the battery terminals causing a short circuit. It was recommended that persons servicing batteries be provided with rubber or plastic-covered flashlights. Also it was recommended that safety glasses be worn whenever battery servicing was being done.

On October 16th in two separate locations short circuits occurred in the control wiring of locomotives causing small fires in the underground workings of a mine.

On October 18th the operator of a large hole drill at an open-pit mine was assigned to drill a relief hole and to ream or redrill two blocked holes in a partially loaded blasting pattern.

The loaded holes were indicated with 4-foot long, red-painted stakes; however, the driller mistook one such stake lying beside a charged hole for the normal 2-foot-long drilling stake indicating where drilling was to be done. He therefore redrilled a loaded hole to a depth of 45 feet before fragments of ammonium nitrate were observed at the collar of the hole when he immediately stopped the drill. It is believed that the primacord lead into the hole had dropped into the opening and was therefore not apparent. To eliminate the potential for future misunderstanding, patterns or portions thereof will be marked for loading, and no reaming will be permitted under any circumstances inside the marked area.

On October 19th the right front wheel suspension bolts on an open-pit coal haulage truck fractured in fatigue failure while in operation. No injury resulted and the bolts were replaced to a high tensile steel type having a stress rating of 150,000 p.s.i.

On October 23rd a Goodman locomotive battery was being recharged underground when a fire was observed in the locomotive resistors. The fire was quickly extinguished and an investigation revealed that a piece of scrap lumber and a piece of steel were found lying across the charging resistor. A short circuit developed and ignited the wood. It is not known who placed the materials on the resistor or why it had been done.

On October 26th the right front wheel suspension bolts on an open-pit coal haulage truck fractured in fatigue failure while in operation. No person was injured and the bolts were replaced with the same type as used in the October 19th incident.

On October 27th a tramline operator at an open-pit mine was injured when squeezed by a moving discharge hopper connected to the tramline tension pulley. The workman had stopped the tramline to remove a restriction on a conveyor at the discharge terminal. In stopping the tramline the workman turned off and removed the starting key. When the restriction was removed he replaced the key and turned it to the "On" position. At this point he was directed by the foreman to go to the next floor to remove a baffle plate which was suspended into the discharge hopper. Although the workman knew he had turned on the starting key and could hear the warning "start-up" bell which rang for 23 seconds, he and his partner ignored the bell. Thus, he was caught when the starting surge in the tramline cable moved the hopper seven seconds after the bell stopped. The operator also neglected to call the loading terminal operator by radiophone to ensure that the loading terminal was clear to recommence operations. A program of instruction in tramline safe operating procedures will be established for all tramline operators.

On October 27th the driver of a loaded ore truck lost control of the truck when he attempted to move ahead to come in line with another similar vehicle which was waiting to dump its load onto the jaw crusher grizzly. As the truck moved ahead it apparently accelerated faster than was anticipated and struck the rear of the stationary vehicle although brakes had been applied and the engine placed into reverse gear. The impact crushed the cab of the moving vehicle but the driver escaped without injury from the steam-filled cab. It was necessary to get back into the cab to shut off the ignition as the wheels were spinning in reverse. On investigation the operation of the accelerator appeared to be slightly sticky; however, as it had been damaged in the collision the exact condition prior to the accident could not be determined.

On October 29th the operator of a Caterpillar front-end loader received minor injuries when a rock about one cubic foot in size rolled off the extended uplifted bucket as it was loading a truck at an open pit. The rock struck and broke through the windshield of the loader. The steering wheel deflected the rock so that it just grazed the operator. A guard has been made and attached above the window to minimize the chance of repetition of this kind of incident.

On November 1st a D-8 Caterpillar tractor was being used to bulldoze loose rock off an open-pit berm when part of the bench sloughed under the outer track. The operator received minor injuries when he jumped off the tractor before it rolled down to the next bench 70 feet below. It was believed the accident could have been avoided if the supervisors and the tractor operator had thoroughly examined the area and determined the safe method to perform the job. In addition, it was determined that the tractor operator was not experienced in this particulair type of work to which he was assigned. Operating procedures have been upgraded to improve investigation, supervision, and performance of this type of work.

On November 2nd a mill operator at an open-pit mining property sustained crush injuries to his fingers when his left hand was caught between a moving conveyor belt and an idler pulley. He was attempting to clean a conveyor bed with his hand when the incident occurred. It would appear improved job instructional training is indicated.

On November 4th a tractor-trailer unit with a load of concentrate ran off the road between an underground mine camp and the loading dock. A gust of wind blew a swirl of snow onto the windshield of the truck and cut off the driver's visibility. During this time the front right wheel of the truck ran into the overplow on the side of the road and pulled the truck over.

On November 8th extensive fire damage was done to a Le Torneau 15-cubic-yard front-end loader at an open-pit coal operation. The cause of the fire was not recorded; however, it was noted that fire extinguishers were ineffectual and that the loader was buried in coal in order to smother the fire.

On November 17th a small fire was found in dry sulphide concentrate on a ledge in the concentrate storage area at an underground mining property. It is believed the fire was caused by a lighted cigarette butt. The concentrate storage area has been posted as a "No Smoking Area."

On November 24th the smell of propane gas was noticed in an adit level of an underground mine. The ventilating air heater at the portal was examined, and it was found that both of the liquid propane vapourizers had extinguished thus allowing liquid propane to feed into the heater burners. The excess fuel caused an overheating which melted the plexiglass sight hole and the plastic insulation on the wiring for the electric relay which overrides the safety shutdowns during startup. The power shorted out in these wires and thus the normal controls could not shut off the heater fuel supply. On relighting the vapourizers it was then possible to shut off the liquid propane line valve which had frozen in the open position. In order to avoid a recurrence a float valve will be placed in the line between the vapourizers and burners which when actuated will shut off the liquid propane supply.

On November 26th a loaded ore train derailed underground at a newly installed switch. An investigation revealed that one of the rails to the switch was too low thus permitting the wheel flange to ride up over the rail.

On November 26th a trolley locomotive coming out from underground collided with a front-end loader which was cleaning snow at the level crossing at the portal. An investigation revealed that while the portal light warning signal was not functioning properly, the red light warning of an approaching train was burning. Operating instructions have been issued which it is hoped will prevent a recurrence of this type of incident.

On December 2nd an electrician was checking out a heater in the lubrication room of a large power shovel at an open-pit mine when he sustained severe electrical burns to his right hand. As he was pulling the 440-volt, 6.3-ampere heater-cord plug from the outlet receptacle the cable arced in his hand. It would appear that the incident could be attributable to poor maintenance.

On December 4th the counterweight on a large open-pit power shovel struck and extensively damaged a tractor which was working within the swing arc of the shovel body. The shovel operator was unaware of the proximity of the tractor as he had not been contacted by the tractor operator.

On December 6th two right front wheel spindle failures were recorded at an open-pit coal mining operation. In both instances the failures occurred while the haulage trucks were executing tight turns.

On December 9th the driver of an empty 35-ton haulage truck lost control of his vehicle while attempting to pass a similar oncoming vehicle on a narrow road at an open-pit mine. Normally the road used was restricted to one-way traffic but at the time of the incident the other road was under repair. The driver was uninjured when the vehicle ran into a ditch and struck the end of a culvert.

On December 12th a fire occurred in a valve control room and pipe boxes under a 20,000-gallon water storage tank at an open-pit mine. It is believed the fire started by overheating from a propane heater placed in the building to assist in thawing water pipes when the outside temperature was −39 degrees Celsius.

On December 12th an underground miner suffered a noticeable hearing loss, and puncture wounds to his back and to the back of his legs, hands and arms when struck by rock particles during a premature blast in the stope where he was working. The injured man had reprimed nine holes of a missed round, and had connected the new primers with thermalite. In addition, he had cut off the original primers where they entered the unexploded holes. He advised he lit the igniter cord, and after a delay of 10 to 15 seconds he started to walk away from the face, and after walking about five paces a shot went off behind him. The workman's hat was blown off but his light was undamaged so he was able to get out of the stope before the other shots fired. The reason for the premature blast was not known except that possibly one of the trimmed-off old fuses had been pulled out close to the collar of the hole and could have been ignited by the burning thermalite.

On December 14th a fire occurred at a flange joint in the natural gas line to a ventilating air heater at the collar of a mine shaft. The flanged joint in the 1-inch diameter gas pipe located about one foot from the lower west corner of the fan intake apparently opened sufficiently to create a leak which became ignited. It is believed the gas was ignited by an electric spark discharge between the flange faces. An investigation indicated a fan motor in another shaft had burned out and the power was short circuiting to the gas line. The current flow passed along approximately 550 feet of gas line before reaching the flange joint. The actions recommended were that the gas supply line was to be redesigned and relocated, that electrical grounding be checked and improved, and that the gas lines be inspected regularly for leaks.

On December 16th an unattended ½-ton 4-wheel-drive pickup rolled down a slight slope and down a 15-foot embankment and onto ice and a raft in a tailings pond. The truck was extensively damaged when it made a complete rollover and landed on its wheels on the ice. An investigation revealed a defective parking brake, the vehicle was in neutral gear, and that wheel chocks were not used.

On December 17th a short circuit in the electric wiring of a scooptram underground caused a small fire which was quickly extinguished.

On December 20th a small fire occurred in the wooden floor at the base of a fan in the concentrator of an underground mine. The fire smoldered for about 10 hours subsequent to a welding operation being done in that area before it was discovered.

On December 2nd a drill staging platform collapsed in a raise when one of its two steel supporting sprags dislodged. The miner who was working on the platform fell about 20 feet when one of the staging planks caught in the steel raise ladder and thus halted his fall. The workman received minor injuries but was fortunate in that he could have fallen another 100 feet to the raise bottom. The mine operator has directed that when steel support sprags are in use four shall be used.for each set up and that each shift the workmen using the same shall check to ensure the installation is satisfactory.

Dangerous Occurrences, 1976

On January 2nd a ventilating fan in use in an underground mine broke off its mountings and fell over, thus causing a ventilation shutdown in one section of the mine until the fan was repaired and replaced.

On January 2nd a small fire occurred in one wheel of a large haulage truck at an open-pit mine. The cause of the fire was undetermined but was believed to have been either in the armature or wheel motor.

On January 3rd at an underground mine a locomotive operator failed to energize a dead section of trolley line when he took his locomotive into the dead track. The net result was a power flashover, which disintegrated a 1500-volt catenary insulator and allowed the messenger wire to drop. The operator was removed from operating locomotives.

On January 4th, subsequent to a blast at an open-pit mine, a slough of rock occurred from the face of a bench. The moving rock struck and did minor damage to a shovel which, at the time, was positioned with its tracks parallel to the bench face, thus making itself more vulnerable to damage.

On January 5th, a fire of undetermined origin caused extensive damage to the engine and hood of a Kenworth dump truck as it was being serviced in the shop at a sand and gravel operation.

On January 6th, the shop office at an underground mining operation was damaged when run into by a bus. The bus was being raised with a fork lift in order to place stands under the axle when it slipped off and struck the building. The bus was in gear but the brakes had not been set.

On January 6th, a road-grader operator at an open-pit mining operation fainted while driving the grader. The operator's foot slipped off the gas pedal and the vehicle stalled.

On January 6th, a 0.7-tonne truck lost its rear wheel while being driven down a road at an open-pit mine.

On January 7th, a 0.7-tonne truck collided head-on with a large haulage truck on a road at an open-pit mine. The 0.7-tonne truck had just been refuelled and the driver was making visual checks on the gauges and not watching the road along which he was driving.

On January 8th the switch gear and 2584-kilowatt drive motor for an autogenous mill were seriously damaged because of an electrical fault, which caused the electrical panel to malfunction and created a fire in the switch panel. The fire then spread to the motor. The damage was confined mainly to the melting of the switch panel and the grounding out of the motor.

On January 8th a small fire occurred in sulphide concentrate settled on the rail of an overhead crane in the concentrator at an underground mining operation. The fire could have been caused by an ignited cigarette butt found in the centre of the smouldering area or from sparks from a welding operation which was completed in that area a short time previously.

On January 9th, a slough occurred at the face of a gravel pit when a too-high bench was developed. The operator had been directed earlier to develop multiple benches of shorter vertical interval. Fortunately no person was injured.

On January 10th, a large open-pit haulage truck had both front and rear wheels slide over the edge of a dump during a heavy snowstorm. The driver, because of poor visibility due to the falling snow, misunderstood the signals given to him by the dumpman. The vehicle was pulled back onto the dump without incident.

On January 10th, a grader ran into the boiler room at an open-pit mine. Minor damage was done to the building. The operator advised that the vehicle was in gear when he started it and, as the bottom of his boot was snow-covered, it slipped off the clutch pedal. The vehicle, being in reverse gear, backed into the building.

On January 11th, a large open-pit haulage truck swerved to miss a pile of muck on the road but, on seeing another large truck approaching, had to swerve back into the muck. The muck had been spilled on the road by another truck, the driver of which had elevated the box to endeavour to remove frozen muck which was adhering to it. Instructions were issued to all drivers not to elevate the truck box while the vehicle is in motion.

On January 12th, a crusher operator at an underground mining operation shut off a conveyor belt in order to unplug a feed chute. The belt suddenly started up and sent muck down the chute on which he was working. On investigation it was found the belt had started because of a defective switch on the control board. He did not hear the warning starting bell because of the noise of the screen in operation nearby was louder than the bell.

On January 14th, a ball stud on the steering mechanism broke on a large open-pit haulage truck as it was driving along a mine road. Steerage was lost and the vehicle ran through a berm near the road edge then continued into a sand impact barrier on a corner above a canyon. The impact barrier successfully halted the vehicle, which would otherwise have gone down the canyon.

On January 14th, at an underground mine concentrate storage, a slusher bucket failed to stop while being used to load a hopper. The bucket slipped over the retaining barrier and dropped onto a steel floor plate which collapsed. Both plate and bucket fell onto a truck hood, which was damaged. It was noted that, prior to the incident, the slusher motor was smoking. It is believed the accident was due to the inattention of the operator or possibly the clutch adjustment was too tight.

On January 15th a Euclid struck and did minor damage to a fuel truck parked beside it and from which it was being fuelled. The driver of the Euclid was not aware of the fuel truck being beside it and, when it was the Euclid's turn to go to the shovel, he started off. The operator of the fuel truck was inexperienced and had not been properly instructed in that fuelling must be done away from the loading area, and that the receiving vehicle moves to the fuel truck.

On January 18th a 108-tonne Wabco Haulpak truck lost the left rear dual wheel assembly while travelling about 20 kilometres per hour up a slight grade. The wheels rolled back downgrade and off the road. An inspection indicated two wheel bolts were missing, 18 had sheared off, and on 11 the threads had stripped. It was recommended that, in future maintenance checks, the wheel nuts be torqued and, if too many loose bolts are found, that they be removed and replaced with those having improved metallurgical characteristics.

On January 19th a cable broke on the 4½-tonne hoist on the combination 36/4½-tonne overhead travelling crane in the crusher building at an open-pit mining operation. The cable broke when lifting a 3314-kilogram load. The cable had been installed in July 1972, and its last visual inspection was made in January 1976. An inspection of the break indicated some corrosion. No one was injured when the load fell.

On January 22nd the operator of an underground locomotive sustained facial bruises when moving to avoid being struck with rocks and glass when a fall of ground struck the front end of the locomotive he was operating on a main haulage track. On investigation it was found that a rock bolt had rusted through, allowing about 11 kilograms of rock to fall.

On January 22nd a welder was air-arcing on the inside of a truck frame at an open-pit mining operation. During this operation the asbestos blanket he was using caught fire as it was saturated with fuel oil. The welder was instructed to clean up his work area and to ensure he uses a clean asbestos blanket while welding or cutting.

On January 24th a small fire occurred in the heavy duty truck repair shop at an open-pit mining operation when sparks from an air-arcing operation ignited fuel spilled on the floor. It was recommended that improved housekeeping be practised in this shop.

On January 25th a mechanic at an open-pit operation sustained back injuries when he jumped off a large drill as it was rolling out of control down a slight grade. The mechanic was making repairs to the drill after the engine had stalled twice, because of ice in the fuel filters. It is possible the mechanic accidentally released the brake while changing the primary filter.

On January 28th the driver of a 77-tonne truck at an open-pit mine sustained multiple injuries, including a fractured right ankle when he jumped out of the truck, after backing it over a berm at the mine waste dump. It was determined that there was no dump attendant on duty at the time of the accident. The investigation indicated that the truck had backed with sufficient momentum and at such an angle to the dump edge that the right rear wheels climbed the safety berm, which was from 0.6 to 0.76 metre in height at that point. The incident was attributed to poor dumping procedures.

On January 28th, a 1900 P&H shovel was damaged at an open-pit mine when struck by a slough of ground from the face of the bench below which it was working. The bench height was 24 metres and the material broke loose from the upper part of the face and in the vicinity of a fault.

On January 28th, at an underground mine the resistors of a Goodman locomotive were damaged through overheating during a battery charging operation. The cause of the incident was attributed to a faulty controller.

On January 29th, a fall of ground at the face of an open-pit bench broke the survey rod being used by a rod man. The rod man was working too close to an unsafe wall.

On January 30th, extensive fire damage was done to a front-end loader at a sand and gravel producing operation. Apparently leaking hydraulic fluid ignited and was extinguished only by burying the machine with gravel. The loader had been serviced and cleaned the day previous and no leaks were then observed.

On February 1st, a fire occurred at both rear brake drums on an open-pit vehicle. After the fire was extinguished it was determined that hydraulic fluid leaking from the brake cylinders had ignited when the brakes overheated.

On February 4th, a pickup truck parked about 46 metres above and 152 metres horizontally away from the scene of a blasting operation was struck by a piece of flyrock. The vehicle was obviously parked too close to the blast area.

On February 5th a rubber-tired dozer operator at an open-pit mine pushed a mobile power pole into a 575-volt power line, which it severed. Although pushing poles under energized lines is contrary to operating rules except when under supervision, both the operator and his immediate supervisor considered there was adequate clearance as several poles had been moved previously under this line. Subsequently, two electricians were repairing the 575-volt line which had tripped out by de-energizing on severing and was switched off. The line was coiled at the base of a pole which carried the incoming 13,200-volt line and also supported the transformer to 575-volt. The broken 575-volt power line was still connected to the transformer. In pulling out the coil the electricians slacked the line in a way that caused it to come into contact with the input terminals on the 13,200-volt side, resulting in a short to ground through the messenger wire of the insulated 575-volt line. Both electricians received minor shocks which they did not consider serious enough to report. However, because the 13,200-volt line tripped out, the pit shift foreman came to the scene and directed the electricians to go to first aid for examination. A serious accident was prevented here because the 575-volt line was in contact with both the ground and a pole guy wire. The electricians had not recognized the hazard with the 13,200-volt line which should have been disconnected at the pole on which the transformer was located. Additionally, the transformer output was incorrectly installed with the line being above rather than below the input. This now has been corrected. Although isolation of high voltage lines before working on or near them is a standard operational procedure, the situation is being assessed to determine what operational directives may be needed to prevent a recurrence.

On February 5th a 90-tonne ore truck travelling at a speed of 32 kilometres per hour lurched to the left and commenced to run off the open-pit haulage road. When this happened the driver applied the brakes and attempted to turn to the right but found the steering to be very stiff. The vehicle ran through the safety berm at the road side, became airborne for about 3 metres and then struck a sand impact barrier, where it stopped about 2½ metres from the edge of a canyon. On examination, the ball stud on the right steering ram was found to have broken at the site of an old crack. In addition the truck frame was found to have broken on both sides, the cab roof crushed in and the decking damaged; however, the driver was not injured. The investigation was unable to determine why there was a complete lack of steering control but it did demonstrate that the impact barrier had undoubtedly prevented the vehicle from dropping into the canyon.

On February 10th a bus carrying employees and other persons to an underground mining operation collided with a truck carrying concentrate on the mine road. Of the 17 persons on the bus, the driver was seriously injured while five others sustained facial injuries. The drivers of both vehicles had been in radio contact and arrangements were made to pass at a wider section in the narrow road, but it is believed the bus driver apparently misunderstood the proposed arrangement and failed to stop at the passing point. The vehicles collided on a curve where the concentrate truck was on a steep downhill grade.

On February 12th a drill learner employed at an open-pit mine sustained first and second degree burns to his face when he struck a match above the drill water supply tank to determine the amount of water in the tank. He forgot that methanol had been mixed with the water in order to prevent freezing and the methanol vapour exploded when the match was lit.

On February 15th a submarine slide occurred at an open-pit waste dump. The surface expression of the slide was the subsidence of an area 90 metres long and 15 metres wide. It was determined the sloughing was attributed to excessive dumping in the area of failure, so that the dump face was not being advanced in a uniform manner.

On February 22nd a fire occurred in the crusher building at an open-pit mine. It is believed a propane line developed a gas leak, and the gas was ignited by the propane vapourizer pilot light.

On February 22nd a crew bus containing the driver and 16 men was struck by a moderate sized avalanche and swept across the road into a snowbank enroute to an underground mining operation. Snow control measures had been taken to bring down incipient slides in that area just a few hours previously. It is possible the high winds prevailing had built up a cornice on the top of the ridge as a total of 100 centimetres of snow had fallen during the three previous days. On falling, the cornice could have developed the avalanche.

On February 23rd a cagetender at an underground mine failed to secure to the cage a stoping machine in the chuck of which a steel had stuck. As the cage was ascending the stoper slid sideways and the steel caught under a shaft timber set. The stoper and steel flipped out of the cage and fell down the shaft. Fortunately no one was injured and the shaft timbering was not damaged.

On February 25th a fire occurred in the concentrate haulage vehicle repair shop at an underground mine. Repairs had been made to an oil furnace which had flooded but, during the repairs the safety circuitry had been bypassed and the fuel vapours had not been cleared from the fire pot. The furnace had been started and stopped several times in an effort to clean out the excess fuel but the vapour finally exploded, blowing out a front panel and then burned out of control.

On February 29th at an underground coal mine a mechanical failure in the mainpower generator resulted in a 21-hour stoppage of the main ventilation fan.

On February 29th a fire developed in an excess grease buildup on the overheated left rear brake drum of an open-pit haulage vehicle.

On February 29th extensive damage was done to an open-pit shovel which was struck by a large rock which dislodged and cartwheeled down from an upper bench.

On March 2nd a 45-tonne haulage truck ran across an open-pit haul road, broke through a berm and came to rest in an inverted position in a gulley at the base of a 6-metre embankment. The driver, who received only minor injuries, said that he was apparently day-dreaming at the time and became alert too late to avoid an accident.

On March 2nd a crusherman at an underground mine received minor injuries to his left arm when it got caught between an idler pulley and a slow-moving conveyor belt. The accident occurred when the workman was attempting to clean up under the belt.

On March 4th a windstorm dislodged some plyboard sheeting being fastened to a wall adjoining a new addition to the existing mine garage at an open-pit mine.

On March 5th owing to a brake failure in a 90-tonne open-pit haulage truck it backed into another similar truck in the pit area. The moving vehicle was backing when the operator applied the foot brake to stop but, being on a down-grade, continued backing because the foot-brake failed. The operator could have stopped if he had remembered to apply the hand-brake. On checking the brake system, no defects were found.

On March 6th an open-pit dump supervisor sustained a fractured ankle when struck by a rock, which rolled off a truck while it was dumping. The injured man had signalled the truck into dumping position then commenced directing another truck driver as he was backing into the dump. The accident was due to the dumpman standing too close to a truck while it was dumping and in not keeping himself fully aware of the hazards attendant to his job.

On March 6th an unattended 0.7-tonne truck parked on a slight slope on a bench at an open-pit mine rolled down a ramp and over the bench, descending about 12 metres. The operator claimed he had applied the parking brake but that it could not have been working. An investigation indicated the brake to be in good working order and that apparently a chock block had not been used.

On March 10th at an open-pit milling operation an unused section of a 1.5-metre diameter ventilation pipe broke loose from its connection to a plenum. The pipe was partly filled with dust which became airborne at the time of the joint failure. This dust saturated the mill atmosphere to the extent that operations were suspended for one hour to clean up the area.

On March 10th an underground miner suffered extensive bruising from falling rock when a slab section about 450 kilograms broke loose from the stope back and struck the miner as he was scaling the back.

On March 16th a tractor rolled over and down a 76-metre distance from the edge of the road to an underground mine. Ploughing had extended out beyond the road edge and, when the tractor travelled on this section, the snow broke away and slid down the hillside.

On March 18th a grader at an underground mine ran out of control for about 122 metres down an decline before it sheared off a front wheel assembly on striking the wall of the decline. The operator had got off the vehicle, which was on a 15-per cent grade and neglected to drop the blade, chock the wheels, or turn the wheels into the drift wall when leaving the vehicle to talk to some nearby workmen.

On March 22nd at an open-pit mine a large-hole drill toppled on its side when the ground under one track sloughed. The drill was being moved from one area to another and, as the operator misunderstood his supervisor's directions, went to a different location and onto unstable ground.

On March 24th a miner was overcome by carbon monoxide while climbing an inadequately ventilated raise, in which he had blasted the previous shift. It was learned that the miner had not adequately opened the compressed air line valve on firing the round.

On March 26th a mechanic backed a pickup truck, containing a portable welder, about 8 metres along a road at the parking lot at the mine garage at an open-pit mine when he got too close to the road edge on the driver's side. The vehicle capsized, landing on its roof, but the driver was not injured. It is believed the driver did not exercise sufficient care in examining the area prior to backing up.

On March 26th, at an open-pit mine, 35 Procore III primers were found on the garbage dump. It could not be determined how they had got to the dump, but the lead hand blaster in charge of the explosives' storage and use was severely reprimanded for careless handling of explosives.

On March 27th, a loaded 109-tonne truck at an open-pit mine ran off the road and rolled completely over down an 18-metre high embankment. The driver reported the steering and brakes appeared to be in good condition and that he does not recall being sleepy, but was under some emotional tension. The driver was not injured and the vehicle landed on its wheels and was braked to a stop on the road below.

On March 29th, a wedge failure occurred on an open-pit bench. The falling material struck and damaged a power shovel cleaning up at the toe of the lift and some damage was done. The operator was aware of movement having occurred on the fracture planes in the bench face but it had become static prior to its collapse. Prior to the accident the shovel commenced to settle on the track nearest the lift and this caused the shovel to scrape the face and bind. He stopped the equipment with the bucket away from the face and went for lunch when the failure occurred.

On March 29th the front end of a parked pickup truck at an open-pit mine was crushed by an unknown person driving an unidentified vehicle. Obviously the unknown driver had not been driving with due care and attention.

On March 30th a millman at an open-pit mine rolled a 0.7-tonne pickup when it left the road. The driver was uninjured and the investigation determined the vehicle was travelling on the wrong side of the road and that the driver was steering it by using his elbows, as he was using his hands to clean his safety glasses, which had steamed up. This accident was directly attributed to unsafe driving practice.

On March 30th a mechanic working on a power shovel sustained fractures to the right side of his pelvis, his right femur and left foot when he was caught between the bucket hoist cables and the hoist drum when the shovel hoist control lever was accidently drawn into the winding position. The operation of the shovel swing brake was malfunctioning and it was determined the cause was attributable to an air leak at the moisture trap on the lubricating system airline. During the examination to determine this, the shovel power was cut off and the elevated shovel dipper, which was crowded into the bank, dropped to the ground. In so doing the cable rolled freely off the drum and developed a tangle of loops in the shovel house. After the air leak was repaired, the power was reconnected and an attempt was made to reeve the rope by operating the hoist. This was found unsatisfactory so the drum control was placed in the neutral position and the cable was being manually reeled onto the free-wheeling drum. In doing this, the injured man placed himself on top of the hoist drum in order to operate a tugger hoist, which was installed to assist in the reeving. During this period the shovel operator was visited by a truck driver and, when the driver left, the hoist operator got out of his seat to investigate what was being done with the cable. While doing this, his coat caught on the hoist control lever and actuated the hoist as the shovel motor was still in operation. This caused the injured man to lose balance, fall into the cable bight and be wrapped onto the rotating drum. Operating procedures are being revised to ensure the workmen are in safer working positions, to provide a control locking device when required and to prohibit unauthorized entry to the hoist house by other individuals.

On March 30th a failure occurred in the left front suspension of a loaded 90-tonne open-pit haulage truck as it was approaching the crusher dump. The truck had commenced a right turn at the time of failure. When the suspension failed, its upper portion was driven upwards against the frame member which supports the cab decking. This fractured the cross member and drove it upwards several inches. The lifting of the cab pulled the steering shaft off the splines at the steering box, thus causing a loss of direction control. The driver immediately applied the service brakes but the vehicle's momentum, coupled with the loss of steering control, directed it into an impact pile at the crusher dump, which had been placed there for such eventualities. The truck came to rest within a short distance of the top of the pile.

On March 30th an act of sabotage was discovered in the mill at an open-pit mining operation where some individual had made 2-inch cuts on either side of a manlift conveyor belt. It is possible the belt will require being replaced.

On March 31st a collision occurred between an open-pit orehaul unit and a pickup truck. The pickup was travelling downhill at a speed between 48 and 56 kilometres per hour when it commenced skidding and, before it stopped, slid into the right rear wheel of the oncoming truck. The skidding was caused by ice on the road, underlying a thin film of dirt and that possibly the vehicle was travelling too fast.

On April 1st at an open-pit mine an AN/FO explosives' loading unit, having completed loading a row of holes, backed up about 37 metres and collided with a pickup truck parked alongside of the area to be blasted. The driver obviously had not checked the area behind him prior to backing and the parked vehicle should have been parked well clear of the blasting area.

On April 1st a portion of the earth-filled timber crib supporting the tailings' cyclone at the tailings' pond at an open-pit mine failed and slid 60 metres down the hillside to the pond below. A new 4-wheel drive pickup parked on the cribbed ground which failed also dropped into the pond. It was determined that a blocked drain pipe in the fill had caused it to become saturated and, during the installation of an additional drain, water was being used to clean the log cribbing preparatory to cutting the logs. The additional water precipitated the failure of the already saturated ground. The cribbing will be replaced and will be rock-filled instead of with earth, in order to minimize any further possibilities of failure.

On April 5th a major pit wall failure occurred in one wall of an open-pit mining operation. Although a failure had been forecast from movement monitoring, the failure involving the collapse of from 23,000 to 38,000 cubic metres of rock was a far greater amount than had been anticipated. Fortunately a supervisor, observing imminent failure, halted traffic on the haulage ramp below, which was buried about five minutes later. After collapse, a hitherto unknown fault was revealed. As the incident could well have involved men and equipment, areas displaying incipient failure will be more closely monitored in future and will be regarded as capable of presenting a serious hazard potential.

On April 6th a fire of unknown origin destroyed the assay office at Sunro Mine. The fire also destroyed a passenger car parked beside the building. A watchman was at the mine at the time of the incident as were at least three other persons but none are able to explain the cause of the fire.

On April 7th a steering failure occurred in a loaded 45-tonne Haulpak truck. The truck rammed a rock bank and caused a failure in a hydraulic control valve. No person was hurt and the investigation indicated that the spiral shaft stud had broken, thus allowing free movement of the wheels.

On April 7th at an underground mine, a rock bolt in the back of a drift broke and, together with a metal strap, was pushed down against a 1500-volt catenary messenger wire. The protective devices on the electrical circuit cut off the power when a short circuit occurred.

On April 9th an unusual incident occurred after the underground crusher had inadvertently been left running and, on leaving underground, the afternoon shift shut off the mine water supply, from which source the bearing cooling water was obtained. As the mine was not operating the following day, it was not until 10.00 a.m. that a patrol crew shut off the crusher. Additionally, on the previous shift the operation of the crusher had been placed on manual control and, on leaving, the crew shut off the automatic greasing switch control. As a result, the crusher operated about 10 hours without grease or cooling water and, in consequence, it was found the crusher bearings had melted and some damage was done to the shaft.

On April 9th the operator of a D-9 Caterpillar tractor was injured when the tractor rolled over and down an open-pit bench, a distance of 12 metres. The tractor rolled over because it was being worked on unstable ground at the edge of a ramp. The investigation indicated the operator had failed to examine the ground previous to commencing work and the on-site supervisors were negligent in not giving more explicit instructions regarding the work to be done.

On April 10th a workman employed in a roasting plant at an open-pit mining operation was exposed to SO_2 gas when the roaster damper was half-closed, owing to a nut having come loose on the damper mount. The workman was not wearing a gas mask. New maintenance procedures and operating practices were adopted to lessen the possibility of a recurrence.

On April 12th a fire occurred in a small wall-mounted transformer station on a switchboard underground. A workman noticed the revolving signal light on the haulage line was not functioning and, on investigation, found the fire. He shut off the power to the transformer and used a fire extinguisher to put out the fire. The investigation indicated the 500-watt rated transformer was operating at capacity and a fault developed because of moisture in the windings. The fire was probably due to over-rated fuses, which did not clear the fault until the insulation had ignited.

On April 19–20th a small spill of tailings occurred by piping action through the outer starter dam at an open-pit tailings' impoundment. The flow was caused by an accumulation of run-off water between the two dams during the winter months. The silt-laden water entered the reclaim pond at the toe of the outer dam and blocked the filters on the reclaim pumps causing them to stop. The water then accumulated in the pond and approximately 13 600 litres escaped in a 24-hour period through the spillway logs and joined the regular stream run-off of 45 000 to 90 000 litres per minute. The pumps were repaired and halted the escape of water to the creek.

On or about April 24th the explosives' magazine at a strike-bound underground mine was broken into and 23 cases of 2-inch 75% Powerfrac, 2100 metres of type "E" detonating cord and 900 metres of "B" line detonating cord were stolen. Entry was gained by smashing the padlock on the pit gate to the mine and magazine, and, with the aid of a sledge hammer, by breaking a hole through an 8-inch brick and sand wall of the magazine. The theft was reported about two days later and the R.C.M.P. was notified. On May 3rd almost all the Powerfrac, all of the B-line and 1200 metres of E-line detonating cord were recovered by the police and suspects were being investigated.

On April 27th a fire occurred in the area of the oil trap in a compressed air line near the surface compressor installation at an underground mine. An oil leak occurred in one compressor which had been repaired and the line drained. It is presumed that a sufficient amount of oil remained to permit ignition from the temperature increase due to compression.

On April 28th an open-pit production vehicle, while backing around the electrical shop, backed into another vehicle parked in a no-parking area. This incident would have been avoided if the "No Parking" sign had been observed and if the driver of the vehicle had examined the route first before backing.

On April 28th a small fire was started in trees when an avalancher projectile, fired from the road to an underground mining operation, exploded on striking a tree in an area where an attempt was being made to dislodge a potential snowslide.

On April 28th at an open-pit mine an electrician was injured subsequent to receiving an electric shock when the 550-volt circuit on which he was working became energized. Two millwrights were assigned to assist an electrican in changing a sump pump and motor. The millwrights were checking the switches to determine which controlled the power to the electric motor of the pump. During this period the electrician tripped the float switch to the motor and commenced working on the exchange. On finding the power was cut off, the electrician and one millwright returned to the motor control centre, opened the switch control and locked it out. They did not, however, open the cabinet where they would have found the switch shut-off had been rendered inoperative by the bakelite plate connecting the switch handle to the main breaker toggle switch having been removed. The electrician on the on-coming shift failed to check the control switch and to lock it out personally, but commenced to work on the exchanging of the pump and motor. Meanwhile, the sump filled with water to the point that the float-operated, starting-switch closed, and thus energized the circuits. On grasping the energized line, the electrician was rendered semi-conscious and fell onto his face in the sump, where he struck his head. The millwright accompanying him dragged him from the water.

On May 1st a small fire occurred in a slusher loading bin at an underground mine. The fire was discovered subsequent to a welding operation in the bin and it is presumed a hot spark was the cause of the fire.

On May 4th at an open-pit mine an unattended haulage truck, while being loaded, rolled away from the shovel, crossed a haulage road and over an embankment. The truck came to rest approximately 2 metres from the edge of a 12-metre bench. The incident was attributed to driver error, in that on vacating the truck he did not set the Maxibrake or install wheel chocks. Approximately $15,000 damage was done to the truck and the driver was suspended for three days.

On May 5th a collision occurred underground between one moving and one halted 2.7-tonne locomotives. The incident occurred during the blasting period at the end of the shift during which time considerable smoke was in the drift and along which one locomotive was travelling to the shaft station. The other locomotive was taking a servicing crew into the workings but had stopped on encountering the smoke. The servicing crew should not have been entering the workings until all smoke had been removed.

On May 5th a loaded production vehicle stalled in a soft spot while proceeding up a ramp at an open-pit mine. The brakes failed to hold the vehicle which rolled backward into a ditch and onto its right side.

On May 6th a Marion Shovel was being moved under a 4160-volt power line at an open-pit mine when the shovel contacted the neutral wire, tripped out one of the phases and cut off the power to the pit. Operating instructions have been issued requiring shovel operators to ensure adequate clearance is available when moving under power lines and that the shiftboss will be personally responsible for directing the shovel operator during this operation.

On May 9th, a fire occurred in a Payloader at the mill of an open-pit operation. It is presumed a short circuit on a battery cable started a fire which ignited hydraulic hoses. The fire was put out with difficulty, as one of the extinguishers on the vehicle was unserviceable and had to be supplemented by four others which the operator had to find elsewhere.

On May 11th a workman at an open-pit mining operation sustained head injuries when he fell about 4 metres, when the unsecured tram-line loading terminal floor grating on which he was standing collapsed. The floor grating had been temporarily installed during mill construction and was not secured. The grating was replaced by a 1.2-metre-high fence around the opening.

On May 11th a collision occurred underground between a Scooptram and Unimog personnel vehicle. The Unimog was going down ramp and the brakes failed to stop it before it struck the upcoming Scooptram. It is believed the vehicle would have stopped sooner if the emergency brakes had been applied.

On May 15th a rock slide involving about 136 tonnes of rock occurred on the road to an underground mine. Fortunately the slide happened when no one was present.

On May 19th a carton of 250 detonating relays (15 milligrams) was stolen from the cap magazine of an industrial mineral quarry.

Between May 20th and May 26th, 36 sticks, 2.5 centimetres by 20 centimetres, 40% forcite, 50 No. 6 blasting caps and three 3-metre lengths of igniter cord connected tape fuse were stolen from the magazine of a small mining prospect.

On May 21st, a 27-kilogram, 2.3-tonne capacity chain hoist fell about 5 metres and struck a workman on the back at an open-pit mining operation. The hoist had been insecurely attached to a cantilevered I-beam.

On May 23rd at an open-pit mine the motor generator and counterweight fell off a Marion shovel. The investigation made indicated that several of the twenty-four 3.8-centimetre diameter mounting bolts had failed, while the remainder exhibited fatigue crack development at the base of the screw threads.

On May 24th the left front wheel of a 77-tonne open-pit haulage truck broke off at the trailing arm. The investigation made indicated faulty material was the cause of the incident.

On May 27th a crew cab truck, driven by a supervisor, parked too close to a loader while it was in operation and the crew cab was damaged when the loader backed into it.

On May 28th a fire occurred at a leak in a gauge gasket of an oxyacetylene tank unit. The fire burned some of the hoses before it was extinguished and the tank valves closed. The investigation made indicated more care should have been exercised in ensuring the gaskets were properly seated.

On May 31st a workman sustained fractures to his 3rd and 4th lumbar vertebrae when struck by a descending door as he was entering a garage at an open-pit mine. Another workman has just entered through the doorway and had pushed the control button to shut the door when the man who was injured came under it. The investigation indicated the accident resulted from malpractice, combined with the lack of safety devices. Limit switches had been installed but had not been made operative. Directions were issued to connect up the switches and also to encourage workmen to use the personnel doors, rather than the main doors.

On June 1st a fire occurred at the drive end of a bunker conveyor used to carry coal to the boiler coal bunkers and ashes to an ash bin at a powerhouse at an underground mining operation. It is believed the ash bin became overloaded, hot ashes fell over the side of the bin and ignited coal dust lying on the floor. About four hours' time was required to extinguish the fire. Operating instructions have been issued concerning the location and use of fire fighting equipment and for the handling of the hot ashes. A pneumatic coal handling system has been ordered to replace the current bucket elevator.

On June 1st a tractor operator at an open-pit mine stopped the D-8 he was operating at the top of a ramp he was constructing. He engaged the brake lock mechanism and started to climb off to check the grade angle when the "cat" which had the blade elevated started to coast backward downgrade. The operator was thrown off the track and suffered injury to the thoracic area of his spine. An investigation indicated the brake lock mechanism was faulty and automatically released itself with five seconds of application. The lock was repaired and it is recommended that tractor blades should, wherever possible, be dropped to the ground whenever the operator leaves the tractor.

On June 4th, 8th and 11th, three steering failures occurred because of fractures in the ballstud-tie rod assemblies on three 154-tonne haulage vehicles at an open-pit mining operation.

On June 7th the driver of a loaded 90-tonne truck at an open-pit mine fell asleep while driving. The vehicle crossed the road and stalled while attempting to climb an impact barrier at the edge of the road. The barrier undoubtedly saved this man's life.

On June 8th a trammer employed at an underground mine sustained fractures to both femur bones when caught between a timber he was transporting on a locomotive and the frame of the locomotive. The trammer had taken the locomotive to obtain a 15-by-15 centimetre timber two metres in length to assist in retracking a derailed car and had placed the timber crossways in the cab of the 2.7-tonne locomotive. On backing the locomotive the timber caught on the drift wall and crushed the operator against the controls with sufficient force to stall the motor. It was recommended assistance should be made available to motormen to assist, when necessary, in rerailing equipment, however, the operator was in error in that he was transporting material in a dangerous manner on a locomotive.

On June 11th at an open-pit mining operation sagging was observed on the loaded side of a five-centimetre track rope at one of the tramline towers. The rope was retensioned but later in the day sagging was again observed. The transport of ore was halted and an investigation disclosed damage to the track rope on the approach to the tower, as many of the outer strands had failed. The rope was replaced but the cause of the damage remained to be determined.

On June 14th at an open-pit mine prospect a fire occurred which destroyed two trailers. It is believed a marauding bear, looking for food, broke into the cook-house trailer and, in his search, broke a propane gas line and the leaking fuel was subsequently ignited by a pilot light on one of the appliances.

On June 15th a scootcrete was driven over the dump at an underground mine. The operator was dumping in an unauthorized area when a rock jammed the clutching mechanism, preventing the stopping of the vehicle's forward motion.

On June 16th the passenger in an open-pit haulage truck received injuries to his left heel and ankle on jumping out of the truck before it ran into a drainage ditch at the edge of a mine haulage road. The driver was experiencing difficulties in stopping the vehicle as the service and park brakes had failed to stop the vehicle. The vehicle was put into reverse gear but this action only stalled the engine. It was recommended that the retarder should have been used.

On June 18th the driver of a loaded truck had a momentary lapse of attention and almost drove into a rock wall. It is believed that hot weather and boredom caused a lapse of attention. It is recommended that, when drivers are aware they are not alert, they should stop the vehicle and take a short walk around it.

On June 18th a piece of plastic lying on top of a battery charger caught fire at an open-pit mine. The fire was extinguished without further incident. Improved housekeeping would have made an incident like this impossible.

On June 21st a supervisor's truck parked at the side of an open-pit haulage road was struck and damaged by a 90-tonne haulage truck. The haulage truck driver was not watching the road, but was observing a power cable and tower which was being moved under the direction of the supervisor.

On June 22nd the driver of a wheeled tractor failed to drop the blade, set the brakes, or chock the tractor on leaving it. The net result was that it started to roll and eventually ran into a fuel truck parked below it. This accident was attributed to driver error.

On June 23rd during the brake testing of production vehicles at an open-pit mine, the brakes on one vehicle caught fire from overheating. The overheating was attributed to the failure to remove the wheel covers during the test.

On June 23rd a welder at an open-pit concentrator received severe facial injuries when struck by a cable lug and shackle when a lug weld failed just as he went to observe what was preventing a load from being lifted by the crane. The release of tension in the cable whipped the lug and shackle. The blow caused the workman to lose balance and fall about four metres. The accident was attributed to employee inexperience in not being adequately instructed in safe crane-hoisting procedures.

On June 25th a welder employed at an underground machine shop pressurized a Scooptram hydraulic tank to 758 kilopascal while searching for leaks in the tank. This action caused the tank to rupture along the side and top. The welder has not been adequately instructed in the job as the air pressure to test leaks in the vessel should not have exceeded 69 kilopascal. Compressed air should never be used on other than properly constructed compressed air tanks or pipes.

On June 25th an unattended 0.7-tonne crew car rolled backward 92 metres and struck a tree. The operator advised the truck would not stay in gear and the parking brake was not functional, however, it should not have deterred him from using the wheel chocks and, better still, in refusing to use unsafe equipment.

On June 25th a workman sustained a dislocated right shoulder at an open-pit mine when he was struck by shifting crane boom sections, which moved when the trailer on which they rested tipped due to unbalanced loading. Improved training in loading and unloading practices would assist in preventing accidents of this type.

On July 4th a Mitsubishi locomotive operator received an electric shock and burns to one of his fingers on attempting to turn on a heater switch. It has not been determined exactly how this occurred, although there is a large opening into a 1500-volt circuit below the switch operating handle. The switch installation has been modified to remove a potential hazard from the operator.

On July 4th two large rocks rolled off a pit face and struck a production truck on one of the front wheels and windshield, which it shattered. It was recommended that the shovel operators endeavour to ensure loose rocks have been removed from pit faces.

On July 4th a 154-tonne haulage truck at an open-pit mine was travelling down ramp when the rear wheel assembly separated from the main body of the truck. The main body travelled approximately 60 metres before coming to a halt on the left side of the haulage ramp. The rear wheel assembly swerved to the right across the haulage ramp and descended to one of the benches along which it rolled 120 metres before coming to a halt. An investigation indicated a connection in the nose-cone assembly had failed.

On July 5th a small sulphide fire was started in the concentrate storage bin at an underground mine as a result of sparks which occurred when a slusher pull back cable snapped. An undue delay occurred in extinguishing the fire in that there was a lapse of two hours between the time the fire was reported and when it was being sprayed with water. The incident pointed up the necessity for improved fire fighting equipment and training.

On July 6th a survey chainman at an open-pit was bitten on his left middle finger by a bat. On climbing a steep rock bluff the chainman put his hand into a rock crevice for support and apparently grasped the bat. As some bats have been found to be rabid in this province, any bites received from such animals should receive immediate medical attention.

On July 7th a short circuit in a battery cable on an underground service truck resulted in a fire in the vehicle and required three extinguishers to put the fire out. Improved protective maintenance procedures would assist in eliminating accidents of this type.

On July 7th a rock bolt, supporting a 25-kilovolt cable messenger in a tunnel, fell out and onto the 250-volt trolley line. This act caused a short circuit and overheating in the messenger wire. The overheating melted several plastic hangers and caused a short span of cable to drop. An incoming mancar struck the downed span, causing another 152-metre span of cable messenger to drop. The mancar was stopped, repairs made to the downed cable messenger and a thorough check of eyebolts was instituted.

On July 7th at an open-pit coal mining operation the driver of a haulage truck missed a gear when changing down while descending a pit road. The truck quickly picked up speed as the driver tried shifting to another gear. The truck went out of control and the driver jumped out just before it went over the bank. The driver sustained back injuries. When gearing down previous to descending a steep grade, a full stop assists in being able to reach the desired gear.

On July 8th a millwright at the concentrator of an open-pit mine received injuries to his right hand when it was caught between a conveyor belt and its drive pulley. The leg of the workman's coveralls had snagged, thus tripping him and, as he fell, his hand was caught in the bight between the conveyor belt and its pulley.

On July 10th just prior to midnight a sudden outrush of water from a closed underground mine caused flooding in the townsite and stopped highway traffic for a period of about five hours. The flooding scoured the hillside below the adit and weakened the foundation of the wall on a settling pond near the adit. The normal water outflow was approximately 14 000 litres/minute but, during the flood, reached a crest of 140 000 litres/minute and then dropped to about 28 000 litres/minute. It is possible an underground stope filled with water which was released suddenly as no other cause of flooding was determined.

On July 13th an underground miner suffered a fractured left leg when struck by a rock which rolled onto him as he was barring at a drawhole.

On July 15th, a compressor was ruined by a fire at the compressor house at an open-pit mine when the oil temperature control switch failed to function when the oil overheated. The compressor continued to run while attempts were being made to control the fire.

On July 15th a fire occurred on an open-pit production truck when a welding operation caused a fuel-soaked hose to ignite. The fire was quickly brought under control. This incident points up the need for good maintenance to remove or cover flammable materials during welding operations and to maintain adequate fire protection also.

On July 15th an ore haulage truck backed over the dump edge at a haulage adit ore pass. The truck stopped him when the transmission case grounded. The investigation revealed that dumping was being done at an authorized dump, there was no brow log, and the driver was inattentive. This may have been attributable to drugs, which had been prescribed for a toothache.

On July 20th a loaded 40-tonne truck and 0.7-tonne pickup truck collided on a single traffic lane bridge on the haulage road to an open-pit mine. The approaches to the bridge were at the foot of two hills. The accident was attributed to poor driving practices by both drivers; however, the loaded truck was almost across the bridge when struck, hence the driver of the pickup should have exercised more care on approaching the bridge.

On July 21st a fire occurred underground when a power cable ignited after a short circuit failed to kick out a faulty circuit breaker.

On July 27th the operator of a forklift truck sustained bruise injuries when the fork lift he was operating got out of control, ran down an embankment and overturned. The incident was attributed to driver error.

During the month of July a number of complaints were received from different operators concerning defective capped fuse assemblies. The supplier was contacted and, after investigation, it was determined the defective assemblies had been imported to Canada during an operational suspension at the Canadian plant. It would appear that the spark-sensitive detonating charge had become coated with a layer of insensitive PETN. It was presumed the pistons or plungers which pushed in the base PETN charge were not cleaned before placing the spark-sensitive charge and thus could have coated this charge. Defective shipments were replaced with Canadian-manufactured assemblies.

On July 21st a small fire was reported in the crowd-brake assembly on a power shovel. It was found that the crowd-brake shoe had slipped, thus permitting metal-to-metal contact.

On July 24th at an open-pit mine an ore-control technician was endeavouring to walk across the face of a bench, at the foot of which a shovel was loading trucks. The technician had not warned the shovel operator to stop operations.

On July 30th a fire occurred on a D-8 tractor working on the surface at an underground mining operation. A hydraulic hose burst and the operator shut off the engine. He later decided to restart the engine when a flash of flame occurred, which stopped on shutting off the engine.

On August 2nd a supervisor at the concentrator of an underground mining operation suffered burns to his hands and face when the flammable gases over an xanthate solution storage tank exploded. The supervisor was checking the fluid level in the tank while using a flashlight to illuminate the tank when the explosion occurred. The injured man does not recall if he was smoking at the time of the accident. On being exposed to air and mosture, the xanthate decomposes to release hydrogen sulphide and carbon tetrachloride and it is supposed this mixture had accumulated on top of the tank. Extensive safety procedures were instituted to reduce the hazard potential presented when encountering such explosive atmospheres.

Between August 5th and 9th the run-off from exceptionally heavy rainfalls caused extensive damage to the roads and other installations in the coal mining area in the southeast corner of the province. Three separate unusual occurrence reports were received, detailing the damage done by the flood waters. These included damage to an embankment at a tailings pond; extensive mud slides in one creek bed, which produced a large deposit of mud on the flood plain of the Elk River; and several washouts occurred at culverts on the access road to a third operation.

On August 8th the driver of a haulage truck at an open-pit mine sustained multiple bruises when he backed his vehicle over a dump edge. The driver backed into the dump at an acute angle. The dumpman directed him to pull out and back in at a more normal angle. The driver pulled out but backed in again in such a fashion that one wheel went through the bern. The bank gave way and the truck flipped over once but landed upright. The accident was attributed to driver error, however, it is interesting to note that a seat belt was being worn and the driver's hard hat was found broken after the accident.

On August 9th a fire occurred underground in the relay panel of a Scooptram. After the fire was extinguished the investigation made revealed the anchor bolts on the relay panel had loosened and permitted the panel to drop onto an insulated wire connecting the battery to the alternator. The wire was severed and a short circuit caused the wire to overheat and burn.

On August 9th a truck driver received only minor injuries when he backed a truck through a dump bern while dumping waste rock at a surface dump of an underground mine. The truck rolled down a −35° slope for about 44 metres and came to rest upside down. The accident was attributed to driver error through inattention and also the dumping was supposed to have been done on the flat and then bulldozed over the side.

On August 10th a loaded 32-tonne haulage truck collided with a 0.45-tonne pick-up halted at an angle across the roadway at the foot of an embankment on a single-lane traffic road. The pick-up truck operator had stopped on seeing the approaching truck, but had difficulty in getting into reverse gear, during which time the truck, approaching at about 36 kilometres per hour, was unable to stop before striking the pick-up, which was extensively damaged. There were no injuries to anyone. It was recommended that service vehicles wait for and follow the haulage units, unless radio communication is available.

On August 13th a workman at the ball mill of an open-pit mine sustained hand injuries when the jaws on the ball bucket closed on him when he removed a steel ball jammed in the bucket. Workman was performing a job for which he had not been trained.

On August 15th an electrician working at an open-pit mine received a severe electric shock when turning on the power at a skid-breaker shack. The electrician had been working on the equipment, which he had de-energized and locked out. On completing the job and when he attempted to re-energize, the switch gear tripped out three consecutive times. He re-opened the switch-box and, while trying to reset the switch, he received a strong shock. A directive was issued to all electricians, detailing safe operational procedures to be observed in like circumstances.

On August 19th a workman in an underground mine was suspended from performing blasting duties because he had failed to properly guard the blasting area. After investigating the incident, the District Mining Inspector imposed a two-month suspension of the workman's blasting certificate. The company also suspended the workman from work for a period of five days.

On August 21st the driver of a 90-tonne haulage truck at an open-pit mine sustained a bruised heel on jumping about 3.5 metres to the ground on leaving a haulage truck that had caught fire after an explosion. The high pressure hoist hose burst and sprayed hydraulic fluid over the turbo-chargers and exhaust pipe, where it ignited. The fire damaged the engine cab and tires. Approximately twelve fire extinguishers were used to try to keep the fire under control until the water truck arrived.

On August 26th the blasting certificate of an individual performing surface exploration was suspended for four months for failing to have proper magazine storage for explosives in his possession and for committing a careless act with explosives in that he was using them in an unsafe manner in the vicinity of a private dwelling.

On August 26th the door of a locomotive machine room flew open and struck the drift wall when the locomotive and train started underground. An investigation indicated that the electrician serviceman had neglected to close and lock the door on finishing his normal maintenance on the locomotive.

On August 28th a collision occurred between two trains in the dump area of an underground mine. One of the trains, which was empty, was stationary at the time of the incident. The other train was loaded and was six cars short of the usual 40 cars. The locomotive operator of this train said he made a mistake by going past the regular stop position. The operator of the empty train had stepped out of the locomotive and, on seeing a collision was about to occur, radioed the other operator to stop. Three empty and four loaded cars were derailed but no was injured. The accident was attributed to the loaded train not having been halted at the designed location.

On September 2nd, two cows were seen staggering and falling near the repair shop of an open-pit mine. An investigation was made and it was determined they had drunk a mixture of oil and varsol in an 18-litre pail. One cow died and the other ran off into the brush. A necropsy performed on the dead animal indicated it had died of phenol poisoning.

On September 13th, a workman sustained cuts to his head and multiple bruises when the scraper he was operating at an open-pit mine ran into a ditch and hit the bank after the right front wheel locked. On hitting the bank the operator was thrown out.

On September 14th, an underground workman sustained back injuries when struck by a loose rock near the drift face. The workman had not scaled the back and a rock approximately 45 kilograms in weight struck him as he was measuring for a timber set.

On September 17th, an open-pit shift foreman received an electric shock from a 4160-volt trailing cable as he was attempting to place a hanging pothead onto the cable stand. Although the workman was wearing rubber "hot" gloves he was knocked back about two metres. An investigation showed one of the wires had pulled out of the soldered female pothead connector. The cable had apparently been under repair and was returned to service before the tar-sealing compound had been poured into the connector. Also, the gland ring used to secure the cable to the pothead had not been installed. It is planned to institute a repair log and tagging system to insure that no cable is returned to service before repairs are complete and so indicated.

On September 18th, a 12-cubic metre shovel was halted for servicing as it was ascending a 5 per cent grade. After halting, the operator switched over to crowd to lower the bucket to ground. At this instant the shovel commenced to roll back down the road and built up to a speed about four to five times faster than normal propel speed. On rolling back downgrade, the shovel passed over its own power supply cable, which act cut the power off. The shovel rolled back about 35 metres before stopping. In rolling back at excess speed, the armature of the propel motor disintegrated. On making the necessary repairs the shovel was checked for control malfunction, which was not determined. It is conjectured the solenoid control on the propel brake had stuck, but this could not be repeated on test.

On September 21st an apprentice welder at an open-pit mine sustained only minor injuries when struck by a six-metre length of five-by-ten centimetre steel which penetrated the back of the cab of the truck he was using to transport the steel. As he was backing the vehicle, the overly-long piece of steel, which was not tied, slipped off the truck deck and struck the ground. Steps have now been taken to provide a protective guard behind the cab, to eliminate the practice of hauling overlength materials, and to see that all equipment being transported in trucks is adequately secured.

On September 21st as a railway carload of lead concentrate was being rolled down the tail track it struck the bucket of a backhoe-bucket loader, which was operating adjacent to the railway tracks. The loader spun around, causing the backhoe-bucket to strike and smash the cab of a nearby truck. The concentrate shed-loading operator was not aware of any vehicles working adjacent to the tracks and the workmen there were not alert to watch for rail traffic.

On September 21st a welder at an open-pit concentrator was engaged cutting a metal patch off a rock box when the rubber lining in the box and feed chute ignited. The fire in the box was extinguished but the fire in the chute was not observed at that time. As the fire grew larger it was then observed but, before extinguishers could be obtained, the sprinkler system operated. The spray kept the smoke down, thus obscuring visibility but the fire was eventually extinguished from a distance, however, in the interim the fire had ignited a conveyor belt. This latter fire extended outside the building and, on being observed at that point, it was soon extinguished. It was recommended that, where practical, patch jobs should be avoided, however, if essential, then greater fire protection precautions should be adopted.

On September 22nd a miner at an underground mine was suspended from blasting duties when it was found he had drilled in the bootleg hole of a former round and had also drilled another hole less than 15 centimetres from another bootleg hole. After investigation by the District Inspector, the miner's blasting certificate was suspended for about two months. The operator also issued a two-day work suspension to the miner.

On September 23rd flyrock from a blasting operation performed about 18 metres below the brow of an open-pit passed over the brow and landed about 500 to 600 metres horizontally away, in an area where some of the mine plant buildings were located.

On September 24th one of the five-centimetre tail-ropes under a skip was noted to be acting abnormally during hoisting operations at an underground mine. An inspection at the shaft bottom disclosed a loop in the cable about 1.2 metres from the bottom. An attempt was made twist out the loop but it kept returning. The swivel under the counterweight was then examined. In order to endeavour to take out the loop, the cable at the swivel was rotated five turns. This was done with ease and it was noted that, when the cable was permitted to turn back, it twisted only four times. The skip was then run up and down several times and the loop did not return.

On September 25th a scraper was being used to spread coarse sand at a tailings' dam at an open-pit when the right front axle of the scraper broke and thus permitted the right front drive wheel to fall off. It was recommended that annual non-destructive tests be made on such equipment.

On September 26th some damage was done to a power shovel at an open-pit when a bank slough struck the shovel.

On October 2nd, a truck and concentrate trailer operated by a contractor at an open-pit mine were extensively damaged when they rolled unattended over an embankment from 23 to 30 metres in height. The driver left the truck to assist in the loading of another vehicle. The truck remained stationary for about 20 minutes before rolling over the embankment. The driver could not remember if he had set the brakes prior to leaving the vehicle. It is obvious no wheel chocks were used.

On October 2nd a pipefitter at an underground mine received facial cuts and bruises when struck by the airline header he was disconnecting. He had shut off the air but left the area on an errand before returning to take off the header. In his absence someone turned the air on again and he did not open a valve on the header to ensure the pressure was off.

On October 8th one of two workmen operating a shotcrete machine sustained a cut hand when his hand caught in one of the feed augers on the machine. The workman was brushing gravel-cement mix from the side of one of the augers when his glove was caught in the auger and his hand drawn into the machine, but he managed to extract it with only the noted injury. The accident was attributed to inattentiveness, however, no cleaning should be done beside unguarded moving machinery.

On October 8th a workman in an explosives manufacturing plant at an underground mine had the mid-finger of his right hand caught in a feed auger at the fines bagging machine. The feed spout was being changed, but it was found it had corroded and was frozen to the bagger. In order to remove the spout the workman was jogging the auger switch and, in so doing, had exposed himself to the auger which caught his right hand.

On October 13th a mechanic working at an open-pit mining operation received facial and shoulder bruisers when struck by a 55-kilogram barrel, which broke loose from its sling while being moved with a crane. The barrel fell about three metres before striking the workman.

On October 14th at an open-pit mining operation an empty 90-tonne haulage truck collided with a loader when travelling in the vicinity of the fine ore bin. When the loader operator realized an accident was about to happen, he dropped the loader bucket and applied the brakes. As soon as the truck driver became aware of the loader being in front of him, he applied the brakes also but was too late to avoid a collision. The accident was attributed to the truck being driven on the wrong side of the road.

On October 16th at an open-pit mine a mobile crane capsized when it was being used to move a set of rotary drill track pads. The boom was fully extended to a length of 12 metres and was set at an angle of about 60 degrees. The outriggers were fully retracted. An investigation determined that the 3.6-tonne load being lifted exceeded the crane's maximum operating capacity of 3 tonnes for the circumstances noted. It is also noted this maximum loading should be made only with the outriggers being fully extended.

On October 16th a fire occurred because of a short circuit which developed in the battery wires at the battery box of a production vehicle at an open-pit mine.

On October 17th the driver of a 180-tonne production truck sustained crushed vertebra when he jumped approximately four metres off the truck ladder and onto the ground. The truck had been driven up a short ramp to wait the unloading of the truck ahead. On the application of the foot, hand and maxi-brakes, the driver was unable to halt the backward movement of the truck. He steered the vehicle away from the side of the road and onto the bench, where the truck eventually stopped when it rolled into a rock lying on the berm. The driver had jumped off the vehicle after rolling back about 30 metres and just before it stopped on its own.

On October 18th a fire occurred in the transmission of a passenger bus while operating in the townsite area of an open-pit mining operation. An investigation disclosed a leaking oil pan gasket immediately above the exhaust crossover pipe. The gasket was replaced and a deflector will be mounted over the exhaust pipe to prevent any further escape of oil coming into contact with the hot pipe.

On October 19th a geologist at an underground mine collapsed on climbing a closed manway when he encountered air deficient in oxygen. On collapsing he fell approximately three to four metres down the manway and sustained severe lacerations to his face in the vicinity of his left eye. He did not regain consciousness for about 2½ hours, when he made his way back to the shaft station. The workman had ignored the "Manway Closed" sign at the foot of the manway when he entered it. Because of a past fatality at this mine and under similar conditions, operational instructions were issued, requiring the bottom ladders to be removed. In this instance this was not done, however, the "Manway Closed" sign should not have been ignored.

On October 19th a crane operator received a minor crush injury to his left hand while applying grease to gears, which drive the crane cable drums. He had his hand caught between the clutches. The equipment is being examined to determine if a safer means of lubrication can be developed for this operation.

On October 20th a failure occurred in the right front spindle of a 108-tonne truck. The vehicle was executing a tight turn to the right while travelling at a speed of 8 kilometres per hour. While the axle spindles are checked for failures on a six-month basis, it was recommended these tests be performed at a greater frequency.

On October 20th at an open-pit mine an employee passenger in a crew-cab sustained bruises to his left ribs when the vehicle in which he was riding was struck by another pickup. Other passengers in the pickup were thrown on top of the injured man and thus pushed him violently into the door of the crew-cab. The two vehicles were approaching a road junction near the load-out terminal when the pickup, which was travelling in excess of the posted 24 kilometres per hour speed limit, struck the crew-cab. The investigation completed indicated both drivers had failed to exercise necessary care and attention with respect to existing conditions.

On October 21st at an open-pit operation, an empty 77-tonne truck backed into a loaded 32-tonne truck parked at the side of the road. The trucks were operating on a road of restricted width and, after dumping their loads, were required to back a distance of downhill to the turning point. On backing down, the driver of the 77-tonne truck failed to observe the smaller truck and backed into it.

On October 21st while removing the regulator from a bottle of chlorine at an open-pit mining operation, a repairman found that a bottle valve was frozen in the open position. The work area was cleared of all personnel while two men, equipped with Scott Air Packs, closed the valve with the use of a 30-centimetre crescent wrench.

On October 21st eight 1.1-kilogram packages of Powermex Pillow-Pak explosives were found abandoned on one of the benches at an open-pit mine. The blaster, who had used some of the explosives the previous shift, had neglected to return the unused remainder to the magazine. The blaster's certificate was placed in suspension for a period of 30 days.

On October 25th some person or persons unknown wilfully damaged the automatic hoist control panel at one of the shaft stations in an underground mine. Both the emergency call and jog down switches were broken as well as other damage to the panel. As there is no hoistman and, as the hoist is for services and people, particularly during emergencies, the damage appears to be the work of a deranged individual.

On October 25th, subsequent to the failure of the dynamic retarder on an open-pit production vehicle, a fire occurred in the wheel-motor covers of the rear, disc brakes. The operator advised he was proceeding downhill on a 10% grade at about 16 kilometres/hour when the retarder stopped functioning, due to a loose "Cannon Plug" connection in the dynamic circuit. He could have parked at the side of the road but, as this would obstruct traffic, he decided to continue downgrade to the ramp bottom about 360–400 metres distant. On reaching the bottom and, after the truck was stopped, a fire occurred in the rear brakes. The fire was attributed to overheating due to excess use of the brakes.

On October 26th the driver of a water-tank truck had to jump out of the vehicle cab when an explosion and fire occurred just after the engine was started. The truck was in for repairs and the fire was apparently caused by a broken fuel line, patched with a poorly-connected rubber hose. The fire extensively damaged the engine compartment and cab.

On October 26th two men were injured on jumping out of a Chinook Hiab truck when the vehicle's brakes failed to function, on descending a steep gradient in extreme winter weather conditions. The operator advised he applied the brakes when it appeared necessary to slow down on overtaking a scraper, which was sanding the snow-covered road. The vehicle did not slow down, so an attempt was made to change down in the gearing but, once the shift was in neutral, the operator could not get it back into gear. When it was apparent the vehicle could not be kept on the road, both the driver and passenger jumped out. The truck was destroyed.

On October 26th a small fire occurred near the transmission cooler of a Scooptram in an underground mine. The fire was extinguished, but its cause was not determined.

On October 27th a compactor in use at a tailings dam at an open-pit mine got too near the bank and rolled over the edge, causing some slight damage to the machine.

On October 27th at 10.00 p.m. at an underground mine a leak occurred in the plant's hot water heating system in one of the buried circulation lines. To correct this situation the leak was located on the site and a backhoe directed to uncover the buried pipe. A plan of all buried services showed a 4160-volt buried power cable in the immediate area and, in excavating the timber overlaying this cable was located.

In excavating for the leaking pipe the backhoe bucket caught the 4160-volt cable apparently located outside of the marking timber, grounding and shorting out this cable. The resultant current and voltage surge tripped off the following:

(a) one of the plant feeders—phase-to-phase fault from the ruptured cable.
(b) one of the open-pit feeders—ground fault.
(c) No. 1 and No. 2 primary mill tripped.
(d) an upper-level stench gas remote release.

The open-pit feeder distribution was checked and the breaker reclosed. All services were re-established with the exception of the main level outcast fan. This fan motor was found to have failed.

No. 1 mill motor was reclosed but, once the motor reached synchronous speed, it tripped the main B.C. Hydro breaker on ground fault. A visual inspection of this motor did not show any damage so the incoming feeder was energized and No. 1 mill motor restarted. Once at full speed, it again tripped the main B.C. Hydro feeder on ground fault, indicating a substantial fault in the motor. Subsequent testing showed a ground fault on one of the stator windings.

The stench gas breaker and release mechanism was checked, but no reason could be found for the release.

The ruptured cable was isolated and the fault repaired. The feeder is now re-energized.

As a result of the stench gas release the mine was evacuated, with the exception of seven men who claimed not to have noticed the stench gas odour. This would be quite possible, since the phial that discharged is a secondary unit located in the upper level fresh air intake, not the compressed air line, and only those areas that receive fresh air directly from it would be affected. Another phial, located in the main level fresh air intake did not release.

Once the reason for the stench gas discharge had been determined by the supervisory personnel, the crew were directed to return to work. This would have been around 4.00 a.m. Other than for the main exhaust fan, the ventilation system was operating satisfactorily and it was deemed correct to operate the mine on a normal basis, with the exception of scooptrams, which were used in a light duty capacity only. In effect, production of ore from the mine ceased until the main exhaust fan was repaired and operating, approximately 1½ days later.

On October 28th a hang-up occurred at a draw point below a shrinkage stope. The miners in the stope were warned of the potential danger of a sudden draw down at that end of the stope. However, one miner was operating a scraper over that end of the stope and, when the cable broke, he went in to fix it. The miner was caught by the muck when it moved down, and he was buried up to his armpits. He was rescued unharmed.

On October 30th two production vehicles were in collision on a hill on the road to a waste dump at an open-pit mine. A loaded truck spun out in snow on a steep grade up to a mine waste dump. The driver commenced backing down-grade when another production vehicle was coming up-grade to the dump, also. The driver of the second vehicle failed to realize soon enough that the other truck was backing toward him. The driver of the second vehicle put it into reverse, but the down-coming vehicle struck it before it could get out of the way.

On November 1st an electrician at an open-pit mine attempted to reset a skid breaker for an electric shovel and, when the breaker would not close in, he opened the isolating knife switch on the skid breaker, then opened the side barrier to reset a "sticky" magnetic overload connected to the breaker trip mechanism. He then closed the isolating switch and attempted to close the breaker. When the breaker failed to close, he repeated the procedure again with the same results. He then called his foreman for assistance.

The electrician repeated the procedure one more time while he awaited the arrival of his foreman. But this time he forgot to open the isolating knife switch. When he touched the magnetic overload with his hand he received a 2300-volt shock. The workman collapsed to his knees. Upon recovering he pulled the isolating switch to protect anyone else from coming into contact with the live parts.

Upon arriving, the foreman took the electrician to first aid and subsequently he was taken to the local clinic by ambulance. He was then released and placed under his doctor's care.

The foreman returned to the skid breaker with another electrician. The skid breaker was visually checked, the isolating switch closed and breaker closed in without any problems. When the shovel attempted to start the skid-breaker tripped. At this time it was noticed that one of the pole mounted cutouts was partially open. The cutout was reclosed, and the breaker reclosed allowing the shovel to start.

The skid breaker should have been completely isolated by pulling the pole mount cutouts before attempting any work in the high voltage section of the breaker. The purpose of the gang isolating switch is for locking out or ensuring visible isolation when working on feeder cables. The operation of skid breaker has been reviewed and all electricians in the pit area have been given instruction as to safe operating procedures.

On November 1st the driver of a haulage truck at an open-pit mine neglected to lower the truck box after dumping a load of rock at a storage dump. After travelling about 122 metres from the dump, the up-raised box struck and dislodged a conveyor-support tower. The driver was removed from his duties.

On November 8th a small slide of rock from an open-pit bench struck and slightly damaged a shovel working at the foot of the bench.

On November 10th at an open-pit mine a Lectra-Haul 154-tonne haulage unit was destroyed by fire caused from a faulty dump valve remaining engaged after dumping the previous load. This caused excessive pressure and extreme heat, which ruptured the hydraulic lines spraying the fluid over the hot exhaust pipes which ignited and completely engulfed the unit in flames. The driver was able to evacuate the vehicle by jumping to the ground with only slight injury to his left ankle.

On November 10th a loaded 90-tonne haulage truck ran out of control at an open-pit mine. When the right hand wheels of the truck entered the ditch of the road used as a runaway lane, the vehicle slewed round and the driver, who was not making use of the seat belt, was thrown through the door of the truck onto the deck.

The driver was kept in hospital overnight for observation.

An inspection of the vehicle showed that a blown battery-charging alternator fuse had resulted in a retarder failure. It also indicated that no use had been made of the service brakes, which were found in good mechanical condition.

It is interesting to note that the driver of the runaway truck made use of his two-way radio to warn another 90-tonne truck of the situation. This certainly avoided an accident of a more catastrophic nature as the second truck was about to enter the runaway path of the out-of-control vehicle.

On November 10th a loaded 90-tonne haulage truck ran out of control at an open-pit mine.

Use was made of another road to safely bring the vehicle to a halt.

A loss of retardation power was claimed by the driver. When inspected at the time of the replacement of the planetaries (damaged in the runaway) no reason for a loss of retardation could be found.

On November 14th during routine hoist checks at an underground mine, a malfunctioning solenoid mechanism delayed application of the brakes on an overspeed test. The overspeed warning light came on but the brake application was so late that the counterweight reached the bottom of the shaft while travelling at an estimated ⅓ speed. The counterweight came off track but no damage was done to any equipment. The solenoid was cleaned and the hoist returned to service; however, the following day it was necessary to readjust the limit linkage in the Lilley control, in order to apply the back-out switch to raise the counterweight when it was below the lower limit position.

On November 17th a small but continuous release of rocks from a bench face below which mucking was in progress prompted the removal of the electric shovel and personnel. About two hours later a slump occurred at the point and involved an estimated 2300 tonnes of rock. This was then cleaned up but further movement was apparent so the area was again vacated, following which a slump of an estimated 4500 tonnes occurred. An examination of the face, subsequent to the collapse, indicated typical failure where several shear planes with different orientations had met, thus producing a semi-circular to triangular zone of weakness. This type of failure emphasizes the necessity of personnel within pit areas, to be alert to any signs of incipient failure, particularly when all slip planes are not obvious.

On November 18th a small fire occurred in a truck engine at an open-pit mine after the exhaust became plugged and the manifold overheated.

On November 23rd a workman in an underground mine was struck in the face by the outer end of one of two anchor eye-bolts holding a Sullivan block in a slusher installation. The slusher was being used to clean up a sublevel and, in going out, struck the eye-bolt which broke. The cable tension on the bolt catapulted the broken portion which struck the workman, who was standing about 4 metres from the anchor point. It was recommended that no persons be permitted to be in sublevels in the scraping area.

On November 23rd an open-pit truck driver sustained minor facial cuts when a rock, propelled a distance of about 76 metres by the bursting tire of another 180-tonne truck, shattering his windshield. It is surmised that the exploding tire had been parked on a sharp rock when the truck was being loaded.

On November 24th a 0.7-tonne pick-up truck being driven on an open-pit ramp, skidded approximately 21 metres after a brake application, crossed the road and ran through a one-metre high protective berm. The truck made one complete roll in a distance of 18 metres and came to rest on its wheels. The truck driver, who was possibly driving too fast for the prevailing road conditions, received minor injuries while the body of the truck was extensively damaged.

On November 26th the operator of a Scooptram in an underground mine noticed a loss in air pressure when he attempted to move the machine. He found that the Maxi-brake prevented movement so he again applied the brakes and dismounted to determine the reason for the air loss. Immediately after dismounting, the machine rolled down ramp a distance of 30 metres and struck a drift wall. The operator had failed to drop the bucket or use wheel chocks. The loss of air pressure was found to have been caused by a broken drive belt from the motor to the compressor.

On November 27th a fire occurred in the isolating switch used to disconnect the locomotive repair bay catenary from the trolley main line at an underground mine. The fire occurred during a locomotive switching operation, when the individual operating the isolating switch changed it before the locomotive had cleared the section being grounded. The arcing which caused the fire continued and the power was then cut off at the rectifier near the outer end of the adit. The fire was put out with dry chemical extinguishers but then recommenced with arcing again being evident. Directions were then given to cut off the power at the supply rectifier at the inner end of the tunnel in the mine. When this was done, the arcing stopped and the fire was extinguished. It was noted that none of the three protective devices to avoid such a situation functioned. These were the overcurrent trip set at 1500 amperes and built into the DC breakers; the rate of current rise relay set at 25,000 amperes per second, and an inverse time overcurrent relay. The failure of these devices was attributed to the fact that a "ground" condition was not actually achieved, and to the total static resistance of the system to the rectifier about 16 kilometres away underground.

On November 30th a careless act with explosives occurred when a miner blasted without authorization while men were still working underground, and when the scene of the blasting was not adequately guarded. The workman was suspended from work duties for one day and the Inspector placed his blasting certificate under suspension for two months.

On November 30th at an open-pit mine damage was done to the pull-down chains, drill-head bearings, drill steel and bit on a rotary drill when, during a move, a spring on the propel brake failed to function.

On December 3rd a loaded 32-tonne haulage truck slid out of control on an icy approach to an open-pit mine dump. The truck was travelling at an approximate 24 kilometres per hour and slid about 21 metres before the wheels caught on rock and loose gravel. At this point the momentum of the truck caused it to roll over onto its side during which time the driver sustained only minor injuries. The driver was not wearing a seat belt. The accident was attributed to slippery conditions and to undue care on the part of the driver.

On December 3rd the driver of a loaded 90-tonne haulage truck sustained minor abrasions to his left hand and leg when his out-of-control vehicle crashed into the ditch of a haul road he used as a runaway lane.

It would appear the driver experienced a retarder failure but elected not to make use of his service brakes.

On a previous trip to the breaker station, the driver reported to the pit controller via radio, a *"slow to react retarder"*. At this point in time, there was no indication that the retarder would not hold the truck to the desired speed. After discussion with the pit electricians the driver decided to haul another load.

As this particular occurrence was the third "retarder failure/no use made of service brake" accident at the same property within a five-week period, an intensive retraining of drivers has been initiated with a view to re-examinging emergency procedures with respect to retarder failures, and to publicize data collected with regard to the capabilities of service brakes in overspeed situations. An investigation as to the reasons for the frequency of failure of retarders has also been initiated.

On December 6th a driller at a large open-pit mine reported that he had intersected AN/FO and plastic hole liner while drilling on a pattern immediately behind a previously blasted pattern. The drill was pulled off the pattern and the investigation took place the next morning in the daylight hours. No reinforced Primacord or AN/FO could be found but small pieces of plastic hole liner were observed. The pattern was restaked by instrument and drilling resumed with supervision in attendance as per requirement of the *Mines Regulation Act*, Section 23, Rule No. 275 (b).

On December 13th two barmen at an underground mining operation had drilled a hole in the footing of a head frame in order to provide a passage for a 6900-volt power cable being installed when, during the process of reaming the hole to 12 centimetres in diameter, they cut into a 2300-volt cable buried in the vicinity. An attempt had been made to locate the buried cable and it was believed the current work would have avoided it but, apparently, its actual location was not known. It was recommended that, when excavation work was being done in the vicinity of buried cables, the power be shut off and that the cable position should be accurately recorded on the surface plans.

On December 14th a workman at an open-pit mine drilled in a wall structure using a 1.27-centimetre electric hand drill, powered from a 110-volt extension line. The worker's gloves were wet, and as he held on to the steel structure with his left hand, and the drill in his right, he suddenly felt a shock that momentarily took his breath away.

On investigation, it was found that the drill in question, another similar drill, and an electric disc saw were all wired together to the supply extension, and taped to hold them together. A ground fault developed in this connection. The worker said that he had felt a slight shock from the same drill the previous day, but didn't do anything about it.

The electrican on duty was instructed to install a proper plug-in box on the extension line and proper three-prong plugs on the hand power tools.

On December 14th an underground miner set a charge in a slusher draw-hole, which he believed he had adequately guarded. However, during the blasting operation, a geologist had entered the extensive workings by way of a third and very little-used manway. Neither the miner nor his supervisor were aware of the third entry and it is indeed fortunate the geologist was not injured. Operating procedures have been changed to ensure all supervisors and workmen are thoroughly familiar with their working places by reviewing the mine plans in the engineering office, and that all service personnel, without exception, must inform the shift-boss concerned, of their destinations and intended routes of travel through the workings.

On December 23rd a fire destroyed the auxiliary electric generating station at an underground mining operation. The cause of the fire could not be determined but, from the damage done, it appeared to have started at the west side of two idle diesel generators. The building was being heated with overhead electric heating coils and the only other live equipment in the building was a 150-KVA transformer.

On December 29th on two occasions water and coal spilled from a flume conveyor, cut a channel alongside of the flume, and spilled into a sump before the overflow water ran into the main creek in that area. The flood was caused on both occasions by flume liners breaking free and jamming into the flume, thus creating a back-up of water and coal.

Dangerous Occurrences, 1977

On January 4th a haulage truck was in the shop for routine service. The box was raised and blocked up by piping. During inspection of the rear brake cyclinder the pipe support bent allowing the box to come down to rest on the frame. The worker was able to get out of the way without injury. It was found that the original schedule 80 pipe support was replaced by a piece of galvanized water pipe of the same size. To prevent a recurrence two schedule 80 pipe supports and welded chains are fitted to each truck.

On January 8th a 110-tonne Lectra-Haul production truck at a large open-pit mine drove off of a main haul road and rolled down an embankment coming to rest in an upright position. The truck driver had fallen asleep momentarily. He stayed in the truck and sustained minor injuries to his shoulder and forehead. He was not wearing a seat belt. It was recommended that drivers notify their supervisors when they feel fatigued so that they may take a break. The use of seat belts is mandatory.

On January 8th on graveyard shift a loaded 110-tonne Lectra-Haul production truck drove over a shallow embankment on a main haulage road at a large open-pit mine. The truck rolled over onto its right side into soft muddy material. The incident was due to foggy conditions throughout the area. High-powered lamps have been installed at intersections and fog lamps are being tried on some units. There was no injury.

On January 10th a supervisor at an open-pit coal mine preparation plant sustained minor facial burns when a flash-over occurred as a clip-on ammeter, installed around a conductor in an open energized 600-volt MCC, was being read. It is recommended that clip-on ammeters will only be used by qualified electricians, and in no case will be left unattended on an open switch.

On January 11th fire broke out during the construction of a mine service garage. Gasoline-powered screeders were employed in placing the cement on the mezzanine floor above the service bays. It is assumed that gasoline was spilled, during screeder refueling, onto the floor and was ignited by an unknown source. There were no injuries and little damage.

On January 15th at a large open-pit mine a 32-tonne truck was, due to the poor condition of the roadway, forced to stop about 1.5 metres from the edge of a berm. A portion of the face beneath the truck failed and the truck fell 12.2 metres to the bench below. The driver was uninjured as he had left the truck prior to the incident to obtain assistance. It is recommended that areas that are unsuitable for travel should be barricaded off or otherwise marked. Further, equipment must be kept a safe distance back from the edge of a berm of pit rim.

On January 16th a sand truck pulling away from a fine-ore bin dropped a wheel off the shoulder of the road where it has been over-plowed and rolled onto its side. Damage to the truck was minimal and the driver was unhurt. To correct the incident, the road was widened so that snow plowing would not go beyond the shoulder.

On January 17th an electrician sustained first-and second-degree burns to his hands and face while an electrical supervisor sustained minor burns when they were testing for current leakage in the hoist control of a P. & H. 2800 shovel at an open-pit coal mine. A clip-on ammeter was being used to test a live 550-volt circuit when a flash occurred.

On January 17th an empty haul truck was being driven back to the lowest bench in an open pit in a direction contrary to the regular traffic pattern. It nearly collided with a loaded truck which was leaving the pit. The empty vehicle jumped a windrow of frozen material at the road verge and ran into the pit sump which contained 1½ metres of water. The driver, bruised, but otherwise unharmed was rescued from the sump in the bucket of a front-end loader. The truck was backed out of the sump and driven to the shop. The operator stated that the steering had locked on him, but no mechanical malfunction could be found during testing at the shop.

On January 20th a loaded Kenworth 6 concentrate truck, in order to prevent a collision with a grader ploughing a mining road, skidded off the road and rolled onto its side in a snowbank. The incident occurred on a blind curve in the road. Both vehicles were equipped with radio but that in the grader was defective being able to transmit and receive calls intermittently. Damage to the truck was minor though all concentrate was lost. All drivers of vehicles are to be reinstructed to check radios before shift and that vehicles are not to be driven faster than road conditions allow, and that full sets of chains, provided on all trucks, are to be used when conditions require it. No personal injury was sustained.

On January 24th at an open-pit coal mine, a loaded 90-tonne coal truck spun off the road, which was slippery, into a ditch. On attempting to drive the truck out of the ditch it overturned. The driver sustained severe bruising to his spinal cord, resulting in temporary paralysis of the legs.

On January 24th an underground crew was loading a round with AN/FO. There was a build-up of static electricity in the anoloader because a crew had previously replaced a worn-out lo-stat 1.6-centimetre hose with a 1.9-centimetre low-pressure polyethylene hose they had found nearby. There were no injuries as anodets were used to detonate the round. All crews have been cautioned in the use of anoloaders and the necessity for proper grounding.

On January 24th an underground drill crew drilled a hole directly into a visible bootleg. This was done in contravention of General Rule 79 (a) of the *Mines Regulation Act*, and the worker's blasting certificate was duly suspended.

On January 25th at a large open-pit coal mine, the right front spindle of an M-200 Unit Rig Haul truck failed as the vehicle was negotiating a right-hand turn on a dump. The driver estimated that he was travelling at 16 km/h at the time of the failure. Road conditions were good with no rough areas. Routine ultra-sonic inspections are carried out at the property every 2,000 operating hours.

On January 26th a Cat tipped a large boulder off a drill access berm above a congested work area at an open-pit mine. The falling rock collided with a pick-up truck damaging the tailgate, rear bumper, and driver's side of the back panel. In future, no Cat movement will be allowed along berms while there is congested traffic below.

On January 27th at an underground operation, a small fire was noted in the concentrate storage area adjacent to the locomotive repair bay. The fire was quickly extinguished. Cause of the fire was attributed to either a smoldering cigarette butt or a spark or piece of hot metal from welding operations. Crews were cautioned regarding the flammability of dry concentrate, and supervisors are to continually ensure that proper welding procedures are being followed throughout their areas.

On January 28th at an open-pit mine warehouse, a truck driver was injured while helping to unload a top-heavy crate from a truck. The crate was being manipulated into position with a forklift when it tipped, pinning the truck driver to the side of the truck. Resulting injuries included cracked ribs and bruises to shoulders, arms and hips.

On January 28th in a heavy-duty shop at an open-pit mine, hydraulic fluid was ignited by welding a hoist support. The fire was quickly extinguished with no injury or damage.

On February 1st an underground miner was seriously injured when struck on the head by a large piece of loose. The loose, 0.6 × 0.6 × 0.15 metres, fractured the worker's third and fourth cervical vertebrae.

During the early part of February, routine air samples taken in a mined-out area of an underground coal mine showed marked increases in the quantities of carbon monoxide and carbon dioxide issuing from the area. It was assumed that spontaneous heating was in progress in the gob area. Stoppings were erected to isolate the area and to reduce the quantity of air entering this zone of spontaneous heating. Toward the end of February, sampling indicating a trend toward a reduction in heating activity in the gob.

On February 9th at an open-pit mining operation a mobile crane tipped over while being operated by a trainee operator. While trying to escape the operator's foot was caught in the cab door, and he fell onto his hands, injuring his right wrist.

On February 15th a telephone lineman working on a transmission tower 6 metres above ground momentarily lost consciousness. The cause was suspected to be electric shock, but this has been ruled out by medical authorities. The cause is still under investigation.

On February 15th a fire occurred in the wash plant of an open-pit coal mine. No injuries were sustained and property damage was minor. Hot welding slag fell onto a plastic tube carrying kerosene being used as a flotation reagent. Tubing has since been changed to copper.

On February 15th at an open-pit mine a pickup truck was driven over an electric trailing cable to a production drill and a primacord lead line a blaster had strung out preparatory to blasting a section of the bench. The blaster signalled the electrician driving the truck to stop but he failed to do so. Operating procedures are being adopted to prohibit the passage of traffic in the immediate vicinity of blasting operations, and to modify blasting procedures to minimize the exposure of primacord leads to other operations in the pit.

On February 15th at an open-pit mine a mechanic was left in the pit area which had been cleared for a blast. Normal traffic control had been established to prevent unauthorized entry to the blast but the mechanic had somehow passed the check points undetected. An endeavour to improve operational security during blasting procedures is being undertaken.

On February 15th at a large open-pit mine, the right front wheel fell off a fully loaded 110-tonne Lectra-Haul while it was approaching the dump area. The tires had been rotated two days previously but the usual retorquing had not been done. There was no injury to the operator and only minor damage to the vehicle.

On February 17th at a surface plant carpenter shop, two garbage boxes were found to have burned up in the building overnight. There were no flames, and no damage was done to the building. Smoking has since been prohibited in the shop at any time.

On February 21st a tractor-trailer unit servicing an underground mine went out of control and overturned. Investigation revealed no mechanical failure occurred to cause the incident. The unit suffered moderate damage. The driver was unhurt.

On February 21st at an open-pit mine, the raised box of a 59-tonne Terex truck, Unit 105, came in contact with an overhead hydro line carrying 132,000 volts. The truck had just completed dumping its load of road dressing, stopped, and commenced lowering its box which came in contact with the line. The line hooked on the upper right-hand corner of the bullboard, and remained attached as the box continued to descend. The operator remained inside the cab and was cautioned to stay there until the "disconnects" were opened and the line and truck grounded—a period of approximately 2 hours. There was no physical harm to the operator but he did appear to be shaken up and was treated with oxygen.

On February 22nd at a rock quarry, a Euclid R-35 end-dump haulage truck under repair was parked in the shop yard. The motor had been removed. The left front wheel, left rear wheels, and brake drum had also been removed. The front had been blocked, and the rear axle was blocked under the spindle. The mechanic and his helper had reassembled the brake shoes and had jacked the axle to clear away the blocking under the spindle. The brake drum and wheel hub were replaced. At this time they were called away to work on another piece of equipment. While they were away the truck fell off the blocking. Fortunately no one was nearby.

On February 22nd at a large open-pit mine, the operator of a 181-tonne truck pulled into a shovel loading area and began backing into a loading position occupied by a 109-tonne truck being loaded by an 11½ cubic metre electric shovel. In doing so, the 181-tonne truck ran over the shovel electrical trailing cable, and backed into the front of the 109-tonne truck, shearing and demolishing its cab. The driver of the 109-tonne truck could not undo his seat belt fast enough to evacuate the cab, and took a low position on the cab floor as the rear lip of the rock box sliced into the cab windshield and supporting members. He received only minor cuts. Lack of care and attention appears to be the sole contributing factor for such an accident, and the company is re-emphasizing the importance of attentiveness to one's work at all times.

On February 24th at an open-pit mine, while unloading a forklift from a truck, the truck moved away from the loading ramp due to a faulty brake air line. The forklift fell off the truck and rolled onto its side. There was no personal injury, and only minor damage to the forklift. It has since been reiterated that wheelchocks are to be used when trucks are being loaded or unloaded.

On February 24th a slough occurred on a submarine waste dump of an open-pit mine. The failure, which was not observed, and did not involve any equipment, extended over a linear distance of approximately 200 metres and had a maximum depth of about 30 metres in from the dump crest. It has been indicated that the failure would probably have been predicted if survey data, obtained about five days prior to the slough, had been plotted and assessed as soon as possible. The procedure now is to conduct more frequent surveys of the dump and to plot and evaluate the conditions without delay.

On February 25th at an underground coal mining operation, a faceman was using a bar to guide cable onto a hoist drum when his hand slipped down the bar and was caught between the wire cable and the drum.

On February 26th at an open-pit coal mine, a dozer trainee accidentally ran his Hough rubber-tired dozer over a spoil berm and went down about 15 metres. The instructor had assigned the trainee to plough snow in the centre of the spoil. With growing confidence, in the instructor's absence, the trainee decided to try his hand at moving the waste on the brow edge when the accident occurred. Injury to the trainee was minor.

On February 28th the operator of a large tractor-trailer unit servicing an underground mine, attempted to change gears going up a hill. The gears would not mesh, and as the road was slippery, the unit could not be held with brakes, it slid backwards about 60 metres when it hit the snowbank with enough force to jacknife and upset the trailer. The driver was not injured. It was later recommended that drivers should have their gearing selected before proceeding up hills.

On February 28th at an open-pit mine, while the operator of the slurry mix truck was pumping an explosives slurry mixture of AN/FO and aluminum, a flash back and/or back pressure release occurred in the partly full ingredient-holding hopper above the pump. At the same time the face plate of the pump popped off. Apparently there was no accompanying loud report, nor was there injury to the operator.

Examination of the stainless steel pump indicated no discolorations which could be attributed to high heat from an explosion, and the movable parts remained movable without any distortion or damage. Scoring was noticed on the inner pump surfaces, and this scoring appeared to be packed with aluminum grit. Ireco has returned the pump to their head office in Salt Lake City for study. This pump, which is a Waukesha model DO-125 sanitary pump, was replaced with a peristaltic pump which is the type of pump generally used to move slurry-type explosive ingredients. In discussing the matter with the Chief Inspector of Explosives, he indicated that only peristaltic pumps were supposed to be used for pumping slurry.

On February 28th a fire causing approximately $300 damage occurred in a 90-tonne Lectra-Haul unit. It is believed that the fire started as the result of a leak in the heater coil. The cannon box became wet and shorted out igniting the wiring on both sides. Two dry-chemical and one CO_2 extinguishers were used to control the fire as flames kept flashing up until the wires from the battery burned through.

On March 3rd at an underground mine, a mine train struck a Kenworth truck which was crossing the track after dumping. The truck operator had stopped at the track, got out, looked both ways, heard the train crew at the dump but got back into the truck and started across the track. No personal injuries were sustained.

On March 4th at an open-pit mining operation, a 2.5-metre deep by 7.6-metre side ditch collapsed during pipeline laying operations. No injuries occurred as the supervisor of the crew noted a crack developing in the wall of the ditch and was able to warn the men to clear the area.

Investigation showed that the excavation was not supported. Pipe-laying operations were suspended until a support-cage could be obtained.

On March 14th a stope miner was seriously injured at an underground mine when a rockfall occurred in a cut-and-fill stope. A series of 1.8-metre rockbolts failed due to having been anchored in unstable ground which was badly fractured by pressure and was not thought to exist on a hangingwall which had an angle of approximately 60 degrees.

On March 16th an underground equipment operator, driving a Cat 32-tonne truck, entered the portal travelling at approximately 24 km/h with the box in the dump position. The truck came to an abrupt halt, lifting the front wheels off the ground and smashing the truck cab into the back. The cab roof was compressed approximately 0.3 metres, and all windows were broken. The operator, who was not injured, was wearing his hard hat and safety glasses, but no seat belt when the accident occurred.

The truck was purchased new in December 1976, and was in excellent mechanical condition. The operator admitted that he had never experienced problems lowering the truck box and that he was aware of company practice of lowering the truck box prior to leaving the dump.

On March 16th a fire occurred in the house of a 2100 shovel. A labourer was using solvex and rags to clean up around the automatic lubrication system. As he cleaned he threw the dirty rags behind him. He stopped to light a cigarette and threw the match among the rags thinking it was out. He went to pick up a bundle of rags to throw them outside when they broke out in flames. The suit of oilers he was wearing also burst into flames. Approximately $500.00 damage occurred to the hoist brake and transformer wires. The labourer was not injured.

On March 17th at an open-pit mill, a conveyor belt was started up with two mechanics on the belt. A vulcanizing job was being done on the belt. This required 220-volt power for the vulcanizing. This power was temporarily installed off the belt power source ahead of the disconnect. The power source to the belt was locked out at this disconnect. The temporary power malfunctioned and an electrician was called to locate the problem. The electrician asked to have the locks removed so he could energize the disconnect and check the power source through the motor control centre. The electrician stated he would not run the belt. While tracing the power source, the electrician manually engaged the contactor which powered the conveyor. With the power on and the contactor manually engaged, all control circuits and warning devices are overridden, making any lockout of the control circuit inadequate. Other mechanics pulled the two off the belt. There were no injuries.

On March 21st at an underground mine, a collision occurred between a Hudson car ore train and a Goodman diesel locomotive. The locomotive operator did not follow standard operating procedures normally used on gathering haulage.

On March 22nd a 45-tonne truck, fully loaded, while travelling from a stripping area, and proceeding to the main haul-road, left the road and rolled on its right side in a drainage ditch at the edge of the main haul-road. The driver jumped clear of the truck as it left the road and suffered a sprained ankle. The truck driver claimed that the brakes failed and then the engine stopped prior to the accident. A subsequent mechanical inspection has revealed that the brakes were found to be in working order and no fault was found with the engine.

On March 23rd at an underground mine, a trainman entered a main haulage drift with a full train and collided with a trolley locomotive. The trainman was aware of the trolley's location but approached the intersection too fast and was unable to bring his train to a stop in time. There were no injuries, and damage was minimal.

On March 23rd at an open-pit coal mine, a service crew truck backed into a plastic enclosure housing welders who were repairing a shovel. One of the welders tripped and struck his chin causing abrasions. There was no other damage. Inattention of the truck driver was the cause of the incident.

On March 24th in the surface plant of an open-pit mine, the rubber discharge chute of the dryer caught fire and burned off. The fire was quickly extinguished. No personal injuries occurred.

On March 26th at an open-pit mine, a secondary cone crusher jammed causing the clutch to slip and burn before the motor cut off from overload. An employee endeavoured to clear the throat of the crusher from within the dust cover. He was overcome with the smoke and fell two metres down the feed chute and on top of the muck they were endeavouring to clear. The crusher housing should not be entered when a noticeable amount of smoke is present and a properly snugged safety belt and rope should be worn by all persons entering the housing.

On March 29th a diamond-drill hole broke into an exploration drift some 60 metres back from the face where a miner was drilling a drift round. The hole was being drilled from the surface some 140 metres above and had deviated 9 metres from its collared position.

On April 3rd an unoccupied dozer was struck by a dragline bucket at an open-pit coal mine. The accident was attributed to incorrect parking of the dozer (within the swing radius of the dragline).

On April 7th two loaded 91-tonne trucks collided causing considerable damage. The trucks were proceeding to the parking area for shift change when the accident occurred. There were no injuries.

On April 7th a shot was fired in an open pit when a piece of fly rock struck the blaster on the knee. A drill had been moved away from the blast area and the blaster was to fire the shot from this drill. Normal practice was to fire from under the drill deck behind the tracks. When the blaster was ready to fire, he found this portion of the drill in approximately one foot of water. Rather than moving the drill, the blaster decided to fire the shot from the front of the drill, crouched under the motor compartment. This location was in direct line, about 400 feet from the blast. The piece of fly rock possibly came from one of the 18 frost holes being fired with the main blast.

On April 11th at an underground mine a first-aid room underground was found to have been damaged by fire and smoke between shifts. The fire was out but the metal door into the room was still warm. The fire was caused by the ruptured element of an overhead "Calray" heater which dropped a piece of hot metal on a nearby cot and ignited the mattress. All contents of the room were destroyed or damaged by smoke or heat. There were no injuries.

On April 13th a fully loaded 91-tonne haul truck ran onto the shoulder of the road while proceeding down a 7 to 8 per cent grade, and came to a stop when the right front tire came off the wheel when it sank into the soft shoulder material. The driver reported that the dynamic braking failed to hold, and he then applied the service brakes. In the process of doing so, the truck moved onto the shoulder of the road where it finally came to a stop by sinking into it. Shop tests indicated that the service brakes functioned correctly, but that the dynamic brakes failed at a speed in excess of 38 km per hour. This failure was attributed to a tapering adjustment, which was then corrected and the unit tested out with positive results. There were no injuries.

On April 14th in an underground coal mine, mechanical heating between the retaining bearing bushing and the shaft of an electric motor resulted in an open flame occurring along the shaft. The quick and commendable action of the operators ensured that the flame was extinguished within a very short time. No injuries were sustained.

On April 16th a bus collided with a pick-up truck at an open-pit coal mine operation. The accident was attributed to negligence on the part of the bus driver who cut the corner on the wrong side of the road at the intersection of two pit haul roads. Minor injuries were sustained by the driver and two passengers in the pick-up and by one passenger in the bus.

On April 16th on a mining access road there was a three-vehicle accident involving two pick-up trucks and a grader. The grader was heading south in a turn. The two pick-up's were heading north and failed to call in their positions by radio. This, together with slippery road conditions, poor visibility, and the sharp turn on the road contributed to the collision. One pick-up truck was slightly damaged. There were no injuries.

On April 17th an electrician working in an underground coal mine sustained burns to both hands and a bruised shoulder when he received an electrical shock while coupling a 6900-volt cable to the high tension side of a transformer. Standard isolation and lock-out procedure had not been followed with respect to the incoming feeder cable.

On April 18th a small explosion took place in the jaw of an underground crusher, throwing up a small handful of muck. It is assumed that a blasting cap or small amount of powder may have gone off in the crusher jaws. It was recommended that all muck pieces must be thoroughly inspected for unexploded explosives. There was no personal injury or damage to equipment.

On April 20th while a sub-contractor employee was refastening siding onto a building at a surface coal mine operation, he drilled through a steel channel and into a 550-volt cable.

The drill was double insulated and the man received no injuries. Check procedures to prevent a recurrence have been implemented.

On April 20th a shovel operator received bruises to an arm and leg, and a deep cut to his cheek from flying glass. This occurred while the operator was applying pressure to a large boulder and a chunk or chunks broke off and flew into the operator's cab through the upper front window.

On April 21st in the mill of an underground mine, a fire broke out in a Clarkson reagent feeder and spread to nearby feeders and reagents. The two feeders were burned and the wiring for two other feeders was also burned. The fire was extinguished with dry chemical extinguishers. It would appear that reagent leaked into the feeder receptacle box shorting the wiring and igniting the wiring and nearby reagent. It was recommended that all places where reagents are stored or utilized must be kept clean. Any spillage must be cleaned up immediately, and all areas should be hosed down before shutdown periods such as weekends.

On April 25th a grader ran out of control and was forced to use a runaway lane while descending the mine access road of an open-pit coal mine. No injuries were sustained by the grader operator. It would appear that the operator inadvertently placed the gear selector in neutral. No efforts were made to use the emergency brake or to drop the blade of the grader to the ground.

On April 28th a small explosion took place at a drift face of an underground mine. One man was injured around the right eye and right side of his face, and was transferred by ambulance to hospital for an operation. It was assumed that part of one stick of explosive failed to detonate and was lodged in cracks in the rock near the right knee hole and detonated when struck by a bit attached to a 2.5-metre drill steel which was in a machine running at half throttle, when the miner was attempting to move his machine from one hole to another and lost his balance.

On April 29th a 110-tonne truck tipped on its side at an open-pit coal mine when it was steered into a roadside berm to avoid running into a slower moving .91-tonne pick-up. No injuries occurred. Congestion caused by road repairs resulted in slower traffic speeds which the truck driver failed to anticipate. The driver's action in running the truck into the berm no doubt avoided a more serious accident.

On April 29th a 60-tonne Terex truck backed into the front end of another 60-tonne Terex truck which was in position to be loaded. The driver of the first truck was deliberately trying to cut into the line-up. No one was hurt and the only damage was to the radiator of the second truck.

On May 2nd a M-120 haulage truck skidded on a slippery flat road surface due to rain and entered a ditch that was approximately 1 metre deep at a large open-pit mine. There were no injuries to the driver and no damage to the vehicle.

On May 5th during daylight hours a Ray-Go compactor overturned at a large open-pit mine while compacting recently placed sand on the downstream side of a tailings dam. The equipment operator who had been operating the compactor for approximately one month experienced some difficulty near the edge of the road and attempted to back the machine up-grade and at the same time turn the machine slightly in order to get closer to the road centre. During this manoeuvre, the vibrating of the machine caused it to slip sideways and the sand embankment gave way. The operator, realizing that the compactor was tipping, shut the machine off and stepped off. The machine came to rest on its side. There were no injuries, and no damage to the equipment.

On May 8th a 0.68-tonne pick-up truck at a large open-pit mine rolled forward over an embankment which was 5 metres in height. The operator had left the vehicle with the motor running, transmission in neutral, and reported that he had applied the emergency braking system. There were no injuries; however, considerable damage was done to the vehicle.

On May 8th vandals entered an open-pit and broke two floodlights, emptied several grease cartridges and a grease gun, started a compressor, which they left running because they were unable to shut it down, pried boards off the detonator cap house, tried to start an 82-30 Terex bulldozer, and finally ripped the ignition switch out of the dash, and jammed a piece of steel into the drive line universal joint. Suspects were apprehended.

On May 11th a diesel-powered supply vehicle went out of control on an incline at an underground coal mine. It was reported that the operator stopped the vehicle on the incline to unload supplies, and when he did so the engine stopped and the vehicle started to move down-hill. The operator jumped off and escaped injury.

On May 11th at an open-pit mine the power cable between the switch house and the shovel gear box blew apart as the power was being turned on. On investigation it was found the cable was spliced and may have become damaged as it was near the door. It was recommended to relocate the cables and that cables and splices not be allowed at this location. There were no injuries.

On May 13th fly rock from an open-pit blast went through the roof of a new shop building and also struck and damaged a wall panel on the same building. The fly rock was evidently the result of an overloaded hole which was not reported properly to the oncoming shift. Better communications were recommended.

On May 14th near the end of the graveyard shift a fully loaded M-120 Lectra Haul truck left the haul road and came to rest in a ditch about 0.6 metre deep when the driver fell asleep. It has been recommended that drivers, or other equipment operators, be encouraged to stop and rest if they feel any symptoms of drowsiness.

On May 17th at an open-pit coal mine operation the driver of a 108-tonne Wabco truck sustained a broken femur when his vehicle was in collision with a similar vehicle. One vehicle was in the dumping position at a double-truck-width breaker-station dump when a second vehicle commenced to back up into the remaining position approaching and crossing the path of the stationary vehicle on his blind side. The first vehicle, the driver of which failed to observe the approaching vehicle, started to pull away from the dump and was struck by the tail-end of the truck. The cab of the damaged vehicle was torn off in the collision, leaving the seat intact, and the driver fell to the ground. It is understood that the injured person was not wearing a seat belt at the time of the accident.

On May 17th approximately 2 250 litres of tailings leaked out at a pipe joint. The tailings were contained in the impoundment pond and the leak repaired. However, the next morning a crew dispatched to the area to measure line thickness noticed a leak developing around the repair coupling. The leak increased rapidly and the concentrator was shut down and most of the tailings in the line above the leak diverted into the emergency tailings pond. The remainder of the tailings were contained by the Highland Valley road. The spilled material was stiffened with the addition of silt and loaded into trucks and dumped into the emergency tailings pond. A study is being undertaken on the wear in this section of the pipe to find a longer-life pipe material.

On May 18th at a large underground mine the cable on a hoisting supply skip broke about 45 metres above the skip. The skip rolled back down its incline track about 240 metres where it rolled to a stop. There were no injuries and no damage was done. Pieces of the cable were tested, but there was no apparent reason found for the cable failure. The following corrective action was taken: All ropes on supply skips will be given preventive maintenance inspection similar to man hoists. An automatic skip braking system was designed for supply skips.

On May 27th an empty water truck, on backing in to refill at the water tanks, backed into the wall on an enclosure at the tanks far enough to break the gas main to the space heater. An explosion and fire which resulted were extinguished by the operations fire truck crew. To prevent this accident from recurring, water trucks in the future are to be driven parallel to the building rather than backed in.

On May 30th at an open-pit coal mine a mechanic sustained an open fracture to his pelvis when he was struck by a fuel tank weighing approximately 1.0 tonne. Two mechanics were changing the mounts on a fuel tank of a mine truck when the tank came off the hanger-brackets and swung around trapping the injured person against the truck's tire.

On June 6th a cantilevered section of the frame of a conveyor which was being erected at a gravel pit buckled, causing one of the men who was assembling it to fall to the ground. The frame had originally been designed to be cantilevered by itself during erection. The weight of the drive motor, conveyor belt, and troughing rollers overloaded the frame and caused it to collapse.

On June 7th in the concentrator of an underground mine a layer of concentrate dust on top of the dry dust cyclone ignited and over a period of time spread down to the cable tray above the concentrator transfer belt. The smell of SO_2 prompted an investigation and led to the discovery of a small smouldering fire on top of the dry dust cyclone. Once the fire was out gas tests were taken in the area and a fire watch posted. It was concluded that the most likely cause of the fire was a discarded cigarette which had been the cause of similar small fires in the past. It was recommended that the dryer area be designated a "No Smoking" area.

On June 7th at a large open-pit mine a 90-tonne haulage truck almost ran over a service pick-up in the pit. Haulage truck No. 6 was idle for a few hours parked at shovel No. 1, and ran out of air. Haulage truck No. 7 drove next to haulage truck No. 6 to supply starting air. In the meantime, the mechanic's service pick-up arrived and pulled up near the front on the blind side of haulage truck No. 7. Just at this time, the driver of haulage truck No. 7 decided to move a little closer to haulage truck No. 6, not knowing that the pick-up was parked in front of it. When he noticed the flagged antenna of the pick-up he immediately stopped the unit. The front wheel of the haulage truck No. 7 came within 0.60 metre of the driver's seat of the pick-up as the driver was in the process of bailing out on the passenger side. Apparently the haulage truck driver failed to sound his horn before moving the unit.

On June 8th at a sand and gravel operation a fusible disconnect switch exploded causing severe burns to both hands of an employee who was standing in front of this switch. The 20-horsepower motor had developed a short circuit and blown the fuses in the disconnect switch. A non-fused switch in the same circuit located at the motor was pulled, new fuses were installed, and the non-fused switch was closed. The fused disconnect switch then exploded, and the non-fused switch was closed. The fused disconnect switch then exploded, inflicting the burns to the employee. It is probably that the metal in the fuse ionized, permitting the high-voltage current to jump between the three phases by following the ionized metal. High-rupture-capacity fuses have been installed to guard against this.

On June 11th at an open-pit mine a mobile welding and oxy-acetylene field unit was damaged by fire. Apparently the unit was over-filled and the gasoline fumes ignited by the cutting torch which was in use about 10 metres away. The oxygen regulator and the cutting torch hoses were damaged. The fire was put out by dry chemical extinguisher and instructions were issued for greater care for preventing over-filling of these units.

On June 14th in the heading of an underground mine a small explosion occurred as the loader operator was dipping the bucket into the muckpile. There was no flyrock or concussion, but smoke was observed. There were no missholes found in the face, and judging from the amount of powder exploded was probably a portion of a stick. Mixed grit and mixture of powder is very sensitive. There were no injuries or damage to equipment.

On June 15th at a large open-pit mine a bulldozer slid into a mill feeder while pushing ore into a draw hole. The operator received minor injuries to his left femur area. He was not wearing a seat belt at the time of the incident. There was no damage to the equipment.

On June 16th and 20th two separate outbursts of methane gas and coal occurred in the same development entry of an underground coal mine. No injuries were sustained. Further work in the affected entry has been suspended until a parallel driveage catches-up.

On June 17th in the access tunnel of an underground mine the operator of a small diesel-powered personnel carrier "speeder" drove this unit outside the portal to refuel. While the refueling was in progress, another locomotive operator changed the switch to enable his locomotive to pass. He did not return the frogs to the original position. The operator of the speeder, not being aware of the altered position of the frogs, re-entered the tunnel and his vehicle jumped off the track resulting in a broken differential cover. It was recommended that operators be re-instructed to leave all switches lined for main line. There were no injuries.

On June 19th an operator fell into a fine-ore bin. While trying to observe a hole in the feed chute the operator stepped up on the hand rail at the side of the walkway, slipped and fell upon the conveyor which carried him into the fine-ore bin. It is now forbidden for anyone to inspect while the conveyor is running.

On June 20th a 32-tonne truck went out of control on a slippery section of a road in an open-pit coal mine. The vehicle struck the outer berm of the road and rolled over on its roof. The driver sustained only minor injuries The slippery road conditions existing at the time of the accident were attributed to earlier watering for dust control.

On June 21st at an open-pit mine a dozer lost its brakes and went out of control while cleaning spill rock off the pit ramp. The operator ran it into the bank and stopped it. There was no damage to equipment and no personal injuries.

On June 27th at an underground mine a scooptram operator was proceeding down a ramp in second gear when the brakes failed. The operator, unable to engage the emergency brake, tried to stop the equipment by hitting the walls of the ramp. The scooptram finally struck the ventilation doors completely demolishing them along with the frame and door control cylinders. The scooptram was apparently not damaged. There were no injuries.

On June 30th a contractor driller's helper slipped and fell against a portable light plant located on the platform of a rotary drilling unit in use at an open-pit coal mine. The man sustained two broken ribs. The accident was attributed to slippery conditions and poor housekeeping on the drill platform.

On July 1st at a large open-pit mine a 0.7-tonne service vehicle was driven into a ditch approximately 1 metre deep, and rolled on to its left side. There was no injury to the driver and no damage to the vehicle.

On July 3rd on the surface road of an underground mine the driver of a pick-up truck left the road and ended up in a 1.20-metre-deep ditch. Investigation showed no skidmarks on the road and the recently serviced vehicle was in proper mechanical condition. It was concluded that the driver stepped on the accelerator instead of the brake when he neared the edge of the road. The door was bent and creased beyond repair and the front bumper was bent. There was no injury.

On July 4th an employee at a coal preparation plant sustained bruises and lacerations when machinery upon which he was standing was started up. It would appear that "lock-out" procedure had been applied to machinery which was actually being worked on but that the employee stood on adjacent machinery which he had not locked-out. In view of the considerable number of recent accidents involving failure to isolate electrical circuits and to follow strict lock-out procedure, it is considered that an intensive programme be instituted at mines in British Columbia to bring to everyone's attention the importance of locking out.

On July 5th as the haulage trucks were parking for shift change one unit backed into another while attempting to back between two trucks. Damage to the radiator, guard rail and corner of the cab resulted to the truck that was struck. There were no injuries. The parking area has since been enlarged.

On July 9th at an open-pit mine under development a sub-contractor's single engine "Lake Buchaneer" airplane crashed during take-off near the employees' parking lot. Apparently after take-off the plane lost elevation and hit a power pole. The tail section and one wing were torn off and the fuselage came to rest upside down against the guard-house. Apparently the road near the guard-house was used earlier as a take-off and landing strip; however, at this time the plane hit a down draft forcing it to lose over 50 metres in altitude. The pilot, who was also the owner of the airplane, escaped injuries. There was only minor damage to the guard-house and fortunately there were no injuries to the bystanders.

On July 12th a dozer fell to a lower bench when removing unstable fill at an open-pit coal mine operation. It would appear that the upper bench gave way while the dozer was positioned parallel to the edge of the bench. The operator escaped injury and no damage resulted to the machine. It is reported that the operator (a substitute for the regular operator) was inexperienced.

On July 12th at a large open-pit mine a drill operator sustained serious injuries to his left leg while moving a 45R drill down a ramp with the help of a D-9 bulldozer. The dozer had to back off from the drill in order to reposition his angle and when in the process of doing so the drill rolled backwards into the ripper on the rear of the dozer and consequently the cab of the drill was caved in causing the operator to be pinned against the control panel.

On July 14th two apprentice linemen were subjected to electrical shocks when the boom of the line truck made contact with a 13,000-volt overhead power-line at an open-pit coal mine. One of the linemen sustained burns to the right hand and both feet, and required mouth-to-mouth resuscitation. The linemen were in the process of stacking poles beneath the overhead power-line when the boom made contact with the energized power-line. The company's attention has been directed to the provisions of the Workers' Compensation Board's Accident Prevention Regulations with respect to overhead power-lines.

On July 14th a Caterpillar 769 truck was being used to haul rock from the plant site to the tailings dam. The road runs along the tailings pipe then crosses the pipe. While crossing the pipe the driver drove too close to the edge and the truck overturned on its side. The driver sustained minor injuries. Damage to the truck was minimal.

On July 16th two Mark 36 Lectra-Haul production trucks collided on a flat surface at a large open-pit copper mine. The lead truck had stopped to back in a shovel for loading when the Lectra-Haul following failed to keep the proper distance and crashed into the right side of the dump box of the lead truck, completely demolishing the cab of the second unit and causing serious injury to the operator of the following unit. It is assumed that tail-gating was the cause of this unfortunate incident.

On July 21st at a large open-pit copper mine a HD-41B dozer slipped off a low-bed trailer unit after it was loaded for transportation to the shop. The dozer operator was thrown to the ground and sustained a fractured wrist. He was not wearing a seat belt as required by the *Mines Regulation Act*.

On July 21st a haulage truck at an open-pit coal mine ran out of control and the driver of the vehicle utilized a runaway lane to safely bring the vehicle to a halt. Injuries and property damage were thus avoided. It is reported that after having undergone repairs for a dynamic brake failure, when returned to service the vehicle almost immediately suffered concurrent dynamic and service brake failures.

On July 24th a derailment of two cars on an ore tram-line occurred. The tram-line had been down for repairs and on start-up some planks had been left on the rails in the discharge terminal which caused the derailment. Damage was restricted to two cars and one tower. There were no injuries.

On July 25th two persons were injured when struck by flying fragments of the boom winch brake drum which ruptured when it was placed under severe stress during a procedure to raise one side of the shovel to permit removal of a track frame. The procedure is to tilt the unit under power and block as necessary. When the boom shift collar broke and the brake was employed, the entire weight being raised was transferred to it but it could not sustain the load.

On July 28th an electrical fire was detected in the switchgear and quickly extinguished. The fire was believed to be caused by a loose connection on the line side of the switchgear resulting in a flash-over. Damage was minor, but the potential seriousness of such an occurrence has led the company to take steps to install an early warning detector system in load centres.

On July 29th two 32-tonne trucks collided at an open-pit coal mine. Neither of the drivers was injured. One of the units was being positioned ready to back up to a loader when the driver of the second unit attempted to negotiate his vehicle around the first. The accident was attributed to driver inattention.

On July 30th a front-end loader was partially buried in coal while loading out from a stockpile at an open-pit coal mine operation. The operator of the vehicle was not injured. It was considered that although the stockpile of coal was sloped in accordance with normal practice, the unusually dry coal was somewhat fluid and sloughed unexpectedly.

On July 30th an employee was struck and injured by the back swing of the block of a 4.5-tonne overhead crane when a wire rope sling attached to it severed on a sharp edge at its load end during an attempt to remove a rock lodged in the gyratory crusher. Neither proper rigging practice nor the correct procedure was followed.

On August 3rd a 77-tonne Unit Rig backed up and scratched the left rear corner of a 59-tonne Terex. Both trucks commenced backing simultaneously. The Terex operator stopped but the Unit Rig, unaware, continued backing. There were no injuries and no damage to the vehicles. The seriousness of the incident was explained and disciplinary action was taken.

On August 3rd at a large open-pit copper mine a 109-tonne production truck left a haul road and entered a ditch filled with soft muddy material, due to the driver falling asleep. The driver was not injured and damage to the unit was slight.

On August 4th in an underground mine at the draw point a small explosion occurred with the bucket of the scooptram entering the muckpile. A small piece of rock hit the operator on the knee. Investigation found no smoke, only the smell of burned explosive was noticeable. The probable cause of this explosion was a small piece of explosive in the muckpile. Recommendations were that in the future only short-period electrical blasting caps should be used to lessen the possibility of "cut-off holes" and that the prima-cord be cut off flush with the collar of the pre-loaded holes to eliminate the possibility of prima-cord being struck and setting off a premature explosion.

On August 6th in the surface power-house of an underground mine, during the routine shut-down of a diesel-powered electric generator, the engine went into overspeed and the flywheel disintegrated. Inspection of the broken sector of this approximate 4.5-tonne flywheel showed that a crack had existed prior to this incident (probably a casting flaw or as a result of it having been dropped at one time). It was requested that the safe condition of the remaining flywheels be ensured by non-destructive testing, i.e., magnafluxing or X-raying. There were in injuries.

On August 7th in the mill of an underground mine, during a routine feed chute replacement, a bridge crane was used for reassembly. The clearance was underestimated and pendulum movement of the crane was erratic due to an inexperienced operator and a faulty control button. As a result the chute struck against a metal floor extension and one of the two 15.9-millimetre supporting slings snapped transferring the load to the 25-millimetre safety sling. This sudden load transfer broke the mechanical splicing of the sling and the chute fell. Additional contributing factors were underestimation of weight, wrong sling arrangement, and unchecked hook-up points. There were no injuries.

On August 7th at a large open-pit copper mine a loaded 155-tonne production truck left the main haul ramp system and entered a shallow ditch due to a steering problem. The driver was not injured and damage to the unit was slight.

On August 8th an unusual occurrence took place at a large open-pit copper mine involving a 109-tonne Lectra-Haul truck equipped with a tail-gate for hauling unconsolidated material such as land-fill and stumps. The vehicle was proceeding up a steep incline when the load either shifted to the rear or the unit was loaded out of balance, causing the front wheels of the unit to leave the road surface. The unit proceeded to roll backward about 13 metres coming to rest on its tail-gate. The driver was not injured and there was no damage to the truck.

On August 8th two persons were allowed to proceed into a blast area. The guard allowed two people into the area. The general foreman stopped the blast, had the area cleared, rechecked, and started the blast procedure again. There were no injuries or damages. The guard was reprimanded.

On August 10th one haulage truck drove into the rear of another haulage truck. There were three trucks travelling on an access road. The first truck stirred up excessive dust which cut visibility. The second truck stopped to allow the dust to settle. The third truck continued to drive and ran into the rear of the second truck. The driver of the second truck received a skull laceration and the driver of the third truck a sprained knee. The driver of the last truck was reprimanded and driving according to road conditions was emphasized.

On August 12th a pick-up truck driven by a contractor employee collided head-on with a company pick-up. The company pick-up was proceeding up the mine road from the plant site when he observed a pick-up approaching him on the wrong side of the road. He stopped his truck as the other vehicle continued towards him at a constant speed and collided head-on. There were no injuries, but there was extensive damage to both pick-ups.

On August 15th a 91-tonne Lectra-Haul truck lost control going down an 8 per cent ramp and struck the same-type haulage unit proceeding up the ramp loaded. Both drivers received minor injuries. Damage to the trucks was approximately $100,000.00.

On August 16th at a large open-pit copper mine two 109-tonne production haul trucks collided after descending the main ramp system to the pit floor. The driver of the following truck did not keep a safe distance from the lead truck and on using the service brakes found that they did not function properly due to being overheated from using them descending the ramp instead of using the retarder system. No personal injuries occurred and damage to the vehicles was minimal.

On August 16th a mechanic received flash burns on his hands, eyebrows, left ear, and back from a severe electrical arc. The mechanic was attempting to reset the excitation circuit breaker in the low voltage panel on a Marion Drill when the arc occurred. It is assumed one ground fault could have been present for some time and a second occurred as the mechanic closed the excitation breaker. Circuit breakers will be installed in a dead front Westinghouse SDP 600 amp panel located externally on the machinery room away from the relay and contactor cabinet. Ground fault indicating lights will also be installed in the operator's cab.

On August 20th in the mill of an underground mine, the ballast box of a mercury lamp was found smouldering. After disconnection, investigation of the lamp showed no foreign matter (dust or moisture). Probable cause of the overheating was service fatigue.

On August 21st a contract drift crew at an underground mine proceeded to go to surface on the main haulage track with a battery loci without notifying the tramming crew. After starting out they noticed the ore train coming in. They were able to switch off the main line and avoid a collision.

On August 22nd a slide of approximately 2 727 tonnes came down. There was no damage and no personal injuries. This slide was well monitored and guarded.

On August 24th a workman was struck by a tree which was felled by another workman. The struck employee received serious injury, the fourth cervical vertebra being crushed. Three men were instructed to buck-up dead fall on the mining property which would be used to hold plastic over the concentrate on the rail cars. Standing trees were not to be felled as neither workmen had an experience in falling. Absence of close supervision and insufficient clear-cut safe procedures for work being done contributed to this accident.

On August 31st in the concentrate loading bay of an underground mine, a short circuit in a fluorescent light fixture caused concentrate dust in the fixture to smoulder and create some SO_2 fumes. It appears that concentrate dust builds up in these fixtures to the point where the connections can arc across through the dust. It is concluded that this particular light fixture is not suitable for present installation in areas where concentrate dust can build up. It was recommended that existing fixtures in high dust areas be replaced with dust-proof fixtures or that the existing fixtures be cleaned and sealed.

On August 31st at an open-pit coal mine a section of a waste dump failed and 612 000 cubic metres of rock moved downhill a distance of approximately 150 metres. No equipment or personnel were on the dump at the time as regular monitoring (instituted after a consultant's report indicated that the dump was only marginally stable) forecasted that failure was imminent. A dump movement of 6.26 metres had been recorded in the 48 hours preceding the failure. Heavy rains during the previous two weeks were considered as being the cause of the failure.

On September 2nd a Namco propane fork lift caught fire in a mill of an underground mine. It is believed that the cause of the fire was due to faulty electrical wiring below the operating panel. The fire was quickly extinguished with a 1.13-kilogram dry chemical extinguisher. There was no injury sustained by the operator and damage to the unit was considered slight.

On September 2nd an experienced underground miner who was rockbolting the drift back of a 2-metre by 2-metre heading was struck by a fall of rock. The miner and his partner had almost completed rockbolting the back when about one tonne of broken basalt dyke and fault gouge fell from the dyke and struck the miner. The miner received crush injuries to his chest and a broken leg.

On September 16th while charging rods to a rod mill, the operator of the charging machine inadvertently pushed the wrong button, resulting in a rod being propelled into the mill and injuring a workman.

On September 21st at a large gravel pit, two front-end loaders collided while dumping gravel into the same feeder. No injuries were sustained by the operators but extensive damage was caused to the cab of one of the loaders. Poor communication between the operators was the cause of this dangerous occurrence.

On September 21st at an interior open-pit operation, two 32-tonne Haul Pak trucks side-swiped at a relative speed of 8 kilometres per hour. Both trucks were radio controlled and both drivers knew where the other was, because of radio contact. However, when the inexperienced driver saw the loaded truck descending a 7-per-cent grade towards him, he brought his truck to a stop in the middle of the road and froze at the controls. The loaded truck pulled hard to the right against the bank while braking but did not have sufficient room to pass the first unit. It was recommended that defensive driving lectures be given regularly, and that highly strung excitable people be discouraged from driving.

On September 21st a pit haulage truck backed into the rear of an electric shovel. The impact damaged several capacitors and sprayed polychlorinated biphenyls (P.C.B.) within the enclosure. The cabinet's catch basin was also damaged, and P.C.B. dripped onto the ground. Approximately 5.5 litres is believed to have escaped. This was scraped up with a front-end loader and loaded into 2 barrels for disposal. Bushings to two other capacitors failed during dismantling of the power conductors to the capacitors, and this P.C.B. was caught in plastic pails. The P.C.B., protective clothing, and damaged capacitors were placed in 6 other barrels, marked, and segregated. Arrangements for disposal were then made through the Pollution Control Branch.

On September 27th at an interior open-pit operation, a 32-tonne haul truck rolled over on its side off the shoulder of the haul road while backing up to dump fill on the verge. The driver, who was inexperienced (8 days), overshot the dumping point by several hundred metres, and while backing up to the dumping point he backed over the edge of the road. In future, dumping will be done in the presence of a dump man. Driver training will be intensified.

On October 1st at an open-pit coal mine, the operator of a dozer received a minor electric shock when an energized 13.8 KV power line fell across his machine. The dozer was in progress of moving a power line standard when the standard came in contact with the overhead line. It would appear that the normal height of overhead line had been adversely affected by recent unreported damage to a supporting pole. The automatic trip system in the primary substation failed to operate when a fault condition was created by the occurrence.

On October 6th in the mill of an underground mine, the operator of a forklift was attempting to place a skid of drums under the steps of a travelway. The forks got caught in the framework which was unnoticed by the operator, and when he backed up, the steps were twisted apart. Damage to the equipment was minimal and there was no injury. It was recommended that more consideration be given to the storage of bulk items.

On October 9th at a large open-pit copper mine, a Mark 36, 170 Lectra-Haul production truck drove on to a soft shoulder and was pulled into a shallow ditch. The vehicle rolled on to its left side, coming to rest in soft, muddy material. Cause of this incident was attributed to the driver's error. No injury was sustained by the operator and damage to the vehicle was very slight.

On October 11th at a large gravel pit, an H-80 front-end loader rolled on to its side when the operator was excavating rejects from a primary screening plant in the pit area. This incident was caused by the left rear wheel sinking into some very loose sand with the bucket elevated to its highest position, and the wheels turned sharply to the left. There was no injury to the operator as he was wearing his seat belt which held him firmly in position inside the cab, and there was no damage to the front-end loader.

On October 11th at an open-pit mine, a service truck went off the road and down a 9-metre bank. The truck was being pulled up a slippery ramp by a crawler tractor using a 1.27-centimetre cable sling. The sling broke and the truck slid back, jumped a 30-centimetre berm and went over. There were no injuries.

On October 18th in the access tunnel of an underground mine, part of a loaded ore train was derailed. The unit consisted of: the leading electric locomotive with 17 loaded ore cars, an empty personnel car, and the rear locomotive. The last 4 ore cars, the empty man car, and the rear locomotive left the tracks. The man car and the rear locomotive became detached thus dynamiting the air brake system on all rolling stock. After this uncoupling, the front portion travelled about 25 metres only, which lessened the damage considerably. Due to the magnitude of the resulting disorder, it was hard to determine the exact cause; however, it would appear that a horizontal plane of weakness had existed between the head and the web in one or more sections of the rail. There were no injuries. In order to prevent recurrence, the entire length of track was visually inspected, and the detection of any other hidden weak sections by a magnetic or sonic device is presently under investigation.

On October 21st at an open-pit mine, a fuel truck caught fire and burned to total destruction. The fire started in the rear of the truck and the driver was unable to control it with the fire extinguisher he had. Cause of the fire was not determined. There were no injuries.

On October 21st at a mill of an open-pit mine, an employee received a broken arm. The accident occurred while three men were working on a plugged chute at the head end of a conveyor. The chute was a new installation and did not have proper guards or platforms.

On October 21st at an underground mine, while men were cleaning muck from under a loaded ore car to place rail, the raised car slipped off its blocking almost pinning a number of men under it. One jack was hurled out, striking a workman on the thigh. There was no damage to equipment. It was found that a tit on a coupling broke due to the excessive weight of the car being blocked on both ends. It was recommended that when lifting heavy equipment with jacks, and blocking is required, it should be adequately blocked and inspected to ensure no slippage or dropping. Only one end should be raised at a time.

On October 22nd at an open-pit mine, a 91-tonne Lectra-Haul rolled over while dumping a load under the guidance of a dozer operator. The truck rolled to its side in a slow motion. It is believed the dozer operator misjudged the firmness of the dump surface and signalled the truck too far back. There were no injuries and very little damage.

On October 24th at an open-pit operation, three men were removing a screen support tray from a large vibrating screen in a gravel treatment plant. Although one man was working under the screen, the men had not independently supported the tray with a chain block from above or with short posts from below. When the nuts holding the support tray were removed, the support tray fell unexpectedly and the workman below the tray sustained broken ribs and severe bruising.

On October 27th in an underground mine, the main electrical feeding cable had to be repaired, and until completion, the transformer beyond this point was without power. About 10 hours later, after repairs were completed, the transformer was supplied with power again. During this elapsed time, moisture seeped into the transformer causing a flashover from phase to phase then to the ground. The resulting small fire was extinguished with portable fire extinguishers. There were no injuries. It was recommended that in future the transformers and other electrical switch gear be visually and instrumentally checked prior to reconnecting into the circuit.

On October 28th at a quarry operation, the current in a 13,000-volt power supply line apparently flashed between the insulators on a power pole due to an accumulation of rock dust. This burned off the power line which fell to the ground and burned furiously. The area was properly guarded until the power could be shut off. There were no injuries.

On October 30th while working a pit bench with a large front-end loader, the operator noticed smoke and flames in the engine area, and activated the dry chemical fire suppression system. The flames died down, but quickly flared again. The operator then abandoned the vehicle, while the engine was still running. The pit area was evacuated, and the fire more or less extinguished using chemical extinguishers. When the vehicle's tires re-ignited, the situation could not be controlled by chemical extinguishers alone, and a portable water pump and fire hose were brought in to utilize water from the pit sump. The fire was finally extinguished approximately 2½ hours after it was noticed by the operator.

The investigation suggests that a hydraulic system leak in the vicinity of the turbo charger was the most probable cause of the fire, and that the fire could not be suppressed by the vehicle's fire suppression system because the engine, which was not shut off, kept pumping oil into the hot area.

The incident should lead to improvements in fire fighting, and the availability of fire fighting equipment and communications between shifts.

During the latter part of October, early indications of spontaneous combustion were noted at previously abandoned portals of an underground coal mine. Although the mined-out area was already isolated from the present active workings by concrete seals, further efforts were taken to reduce the flow of air through the area by stowing waste material in the two portals.

On November 1st a man-haul bus rear-ended another similar vehicle which was stationary on a surface haul road of an underground coal mine operation. Eleven persons sustained strains to the back, one resulting in lost-time.

On November 2nd at a large underground mine, a loaded 12-car (Granby-type car) train was being pushed onto the dump block when the rail bed gave way. A heavy rain and snow storm had occurred before the incident, and the vibration of the train caused the dump to fail. Four cars went over the dump. There were no injuries. Dumping procedures and track location is to be supervised more closely.

On November 4th at a large open-pit mine, a Mark 36 Production-Haul truck collided with and partially ran over a small Ford pick-up vehicle. The small vehicle was parked on the blind side of the Production unit, and as the Mark 36 attempted to turn and move out of the loading pattern he collided with the smaller vehicle. There was no personal injury as the small vehicle had been vacated prior to the incident. There was no damage to the Production unit but extensive damage was caused to the pick-up truck.

On November 5th at a large open-pit copper mine, fly rock from a blast hit and damaged the fan and motor compartment of a 91-tonne Lectra-Haul. There were no injuries. A possible contributing factor was the over-digging and removal of burden in front of the loaded holes. It was recommended that in future trucks be parked facing away from the blast to provide protection.

On November 6th necessary electrical repairs to a substation resulted in the main ventilating fan of an underground coal mine being shut down for approximately 1½ hours. During the shut-down period methane percentages in the mine's main return airway reached 1.0 to 1.1 per cent, but during the six-hour period following start-up of the fan reduced to the normal 0.3 per cent.

On November 7th in the concentrate-bay area of the mill at an underground mine, a shovel became jammed in the head pulley of a tripper conveyor belt. The belt stopped but the drive belts were loose and continued to turn on the drive sheave. A layer of concentrate dust on the motor mount assembly started to smoulder due to the friction caused by the loose "V" belts. The shovel that jammed the belt probably fell from the tripper platform and it was recommended that these shovels be stored at a different location. There were no injuries.

On November 8th while carrying out repairs to the sticks of a 191 M shovel, a piece of pipe, a 3.6-kilogram sledge hammer, and a porta power jack were used to carry out jacking necessary to fit legs into the saddle blocks. It was necessary to move the shovel into the sticks. While carrying out this procedure all workmen were removed from the immediate vicinity. One workman, however, was inadvertently struck by the hammer, which, with the pipe and porta power jack, were in position at the top. Only the porta power jack had been roped into place to secure it from falling. The injured man was standing clear but the hammer ricocheted, striking him below his hard hat but above the eyes, causing a fracture of the skull.

On November 9th a crew of two men, one being a holder of a valid blasting certificate, blasted in a scram drift without guarding both entrances. The shiftboss entered the unguarded entrance as the blast went off. There were no injuries. The blaster had his certificate suspended for three months.

On November 10th at an interior open-pit haulage operation, a 32-tonne Haulpak truck powered out near the top of an 8 per cent rise in the road and slid backwards. A ¾-per cent counter elevation on the road to the uphill side caused the left rear wheels of the truck to catch the uphill bank. Momentum then caused the truck to slowly swing around nearly 180 degrees and slide into a ditch. No damage or injuries were suffered. More emphasis must be placed on sanding during winter months.

On November 11th at a large open-pit copper mine, a fire broke out in the grid system of a M-120 production haul truck. The fire was quickly extinguished but no cause of the fire was found due to extensive damage. The operator was able to vacate the vehicle quickly so no personal injury was sustained.

On November 12th on the restricted access road of an underground mine, a collision occurred between a company bus and a vehicle unauthorized to use that road. The

"Private Road" sign which is normally posted at the beginning of the private section of the road had been removed the day before to facilitate snow removal. The driver of the private vehicle apparently was not aware of the restriction. There were no injuries. The damage to the bus was slight and damage to the private vehicle was in excess of $300.00. The accident was not investigated by the R.C.M.P. since it occurred on a private road. This incident justifies the restriction of this road to four-wheel-drive vehicles equipped with two-way radios and the following of company road regulations.

On November 15th a trailer unit of a production haul truck rolled over an embankment when the driver attempted to change gears climbing a 7-per cent incline while loaded. The motor on the tractor unit stalled and the brakes would not hold as the vehicle had been parked in deep water prior to being loaded and starting up the incline leading from the limestone quarry floor. The driver was not injured and damage to the trailer unit was considered to be slight. Drivers have been instructed never to park in water holes and never attempt to change gears of large units while climbing steep inclines.

On November 15th at a limestone quarry, a 31.5-tonne haul truck loaded with lime rock left a haul road after failing to negotiate a curve and rolled into a shallow ditch. The driver was fairly inexperienced and was travelling too fast. There was no personal injury but damage to the vehicle was considered extensive.

On November 15th on an interior open-pit haul road, a 32-tonne Haulpak truck fishtailed while negotiating a gentle turn in the road. The truck went over the shoulder and down a 2.5-metre embankment and came to rest on its wheels. The road had not been properly sanded, except by hand, as the sand truck was broken down. It was also determined from skid marks that the truck was travelling too fast for road conditions. The driver suffered a cut on his left arm and bruised ribs on his left side. It is recommended that more attention be paid to sanding, and driving habits be checked regularly.

On November 15th at an underground mine, an operator noted smoke issuing from the front of the engine of his scooptram. The equipment was driven directly to the shop to be checked and it was found that there had been a short on the main electric wiring which was on fire. The fire was put out with the extinguisher on the scooptram. There was no injury. Closer inspection of wiring was recommended.

On November 17th at a large underground mine, a waste train operator did not obtain track clearance at a designated station and ran his waste train into a train of empty man coaches, seriously damaging five of them. A crew was parking the coaches in their usual siding and had a derailment. In putting the coach back on the track this crew were overly long on the main line. Further, an amber warning light in use at the siding switch could not be seen by the waste train operator as it was overshadowed by the glare of a 200-watt bulb burning with no shade on it. The incident was caused because operating procedures were not followed, and lighting arrangements had been changed. Procedures and illumination have been upgraded.

On November 17th at a large underground mine, four coaches of a man train were derailed because a switch was thrown before the train had completely cleared the switch. Two trains were entering the mine with the second train travelling too close to the first. At the switch where the incident happened the trains would take different routes. However, the motorman on the second train did not wait for the first train to clear the switch before activating the switch pull cord. There were no injuries. All trains are now to come to a full stop before activating any switch pull cords. All motormen are to radio their passing of pull-cord switches.

On November 21st at an open-pit coal mine, an unattended haulage truck rolled away from the fueling station and struck another truck. No injuries resulted; however, the cab of the second truck sustained extensive damage. It should be noted that wheel chocks were not in use, although some three weeks previously instructions had been issued requiring their use at this particular location, due to a slight downgrade.

On November 29th at a large open-pit mine, a D-8 bulldozer slid into a mill feeder. This incident was caused by misjudgment on the part of the operator and approaching too close to a feeder which was being drawn down at the time. There was no personal injury and no damage to the dozer.

On November 30th a trailer of a concentrate haul truck jackknifed and slid into a ditch approximately 2 metres deep. This accident was caused by icy road conditions and travelling too fast for the condition of the road surface early in the morning. There was no injury to the driver and no damage to either the tractor or trailer unit.

On November 30th in the underground dump of a mine, a protruding rock bolt from a loaded ore car came in contact with the overhead catenary which is the power source for the locomotives. At this point there is the least vertical clearance between the catenary and the ore cars. This short caused the rectifier located nearby to cut off power supply to this end of the tunnel. The electric arc continued on until the power was manually cut off to the other end of the tunnel.

The pilot inter-trip line (which should have caused disconnection of power at both ends) had been previously damaged and was disconnected. There was no injury. Damage was confined to the floor plate of one ore car. The pilot inter-trip system has been repaired and regular checks will ensure that it will function properly.

On November 30th at an open-pit coal mine under development, an airtrac drill was moved through a loaded blast area after the drill became trapped by the explosives loading operation on a limited access bench. The movement of the drill, which was attended by a supervisor, was carried out with the primacord down-line tails coiled into the unstemmed holes and protected by inserting plastic blast-hole plugs.

On November 30th at a small interior underground mine, one hole in a raise round detonated prematurely. Detonation of the round was by 3-metre assemblies initiated with type "B" ignitor cord. There were 21 holes in the round, and the detonation of the premature hole occurred within 2 minutes of lighting the igniter cord. The miner had left the face and was in a safe location. No one was injured. In future, a tail of a minimum of 2 metres will be used, or sufficient cord to allow the miner to retreat to a safe location before the tail is burned out.

On December 12th on the private access road of an underground mine, a front-end loader backed up into the road from the clearing from which he was removing snow. The driver of a loaded semi-trailer truck assumed that the operator of the loader was aware of his approach since he had notified him by radio. Apparently the loader operator did not receive the message. Damage due to the resulting collision was slight. There were no injuries. It was recommended that operators of vehicles should not rely entirely on radio communication and that defensive driving must be practised.

On December 15th at the camp facilities of an open-pit coal mine operation, an apprentice pipefitter sustained second-degree burns to the forehead when a propane vapourizer, which he had been in the process of thawing out, exploded. The accident was attributed to the use of a propane torch to thaw out the vapourizer.

On December 15th at an underground mine, the main underground ventilation system was shut down due to a power failure from 1.20 a.m. to 7.30 p.m. All work was halted in the mine and resumed at 12.01 a.m. on December 16th.

On December 20th at a mill of an open-pit mine, an electrician received flash burns to his face, eyes, neck, and hands. On checking out a switchbox he placed the switch in the off position and removed the fuses. It is suspected the flash occurred because the electrician touched a hot wire and a terminal with a screwdriver on the live side of the disconnect switch. The arc tripped the panel feeder circuit breaker.

On December 21st at an open-pit coal mine, a parked mini-bus was damaged when struck by a haulage truck. An occupant of the mini-bus sustained minor bruises when vacating the vehicle immediately before the collision. It would appear that the driver of the haulage truck had assumed that the bus had been driven out of the area.

On December 21st at an open-pit coal mine operation, a fire occurred on the left front wheel of an explosives truck as it was returning to the explosives plant. Investigation showed that the presence of water in the hydraulic fluid had probably caused the corrosion and pitting of the cylinder which seized. Coal dust provided the fuel for the fire.

On December 23rd in the concentrate storage bay of an underground mine, a cable broke causing sparks which ignited concentrate dust along the edge of a walkway. The fire was extinguished by a hand water pump. There were no injuries. Damage consisted of a broken cable and sling-holding block. It was recommended that a water line with hose be installed in the concentrate bay.

On December 30th at an open-pit mine, the driver of a 91-tonne ore truck fell asleep while hauling a load of ore to the crusher. This resulted in a collision with another ore truck parked on the side of the road with motor trouble. The parked truck was marked with two flashing lights set up on empty oil drums. There were no injuries, but extensive damage was done to both trucks.

On December 31st an accident occurred near the end of a shift on an open-pit haulage road. The road was not in use, hence sanding was light and the road was reported as slippery. The vehicle was proceeding down the 8 to 8½-per cent grade when it started to slide. When the driver saw the approaching curve he decided to turn into the run-off lane on the right. In so doing he hit the downhill snow bank at the approach, spun, became airborne for 29.5 metres, rolled, and the vehicle came to rest on its side. The two occupants were taken to first aid, checked over, and sent home. Although the driver reportedly indicated brake malfunction on one wheel to his partner, photographs taken of the vehicle tracks on the road immediately after the accident suggest that this was not the cause of the accident, but rather excessive speed for the road conditions encountered was indicated as the probable cause. The driver was not available for comment.

Dangerous Occurrences, 1978

On January 4th on the radio-controlled access road of an underground mine, a near head-on collision occurred between a tractor-trailer unit and a station wagon. Both drivers announced on the radio their position while approaching a blind curve but neither of them heard the report of the other. The station wagon travelled on the wrong (left) side of the 10-metre-wide road, hugging the inside of the curve. The head-on collision was averted but the jack-knifing of the trailer (due to abrupt braking of tractor) almost knocked the station wagon over the drop-off at the outside edge of the road. Only minor injuries were received by the four occupants of the station wagon. Damage was extensive. This near-serious accident was the result of: (a) both drivers were "driving by the radio"; (b) neither driver practised defensive driving; (c) station wagon on left, contrary to rules; (d) speed limits were ignored. A company-sponsored defensive driving course is planned for the drivers of all vehicles in addition to the review of company road regulations.

On January 5th a snow-slide covered an unoccupied bus, which was parked near the access tunnel of an underground coal-mine operation.

On January 9th at a quarry operation, an Air Trac drill operator bent over the drill mast, and the bottom of his raincoat was caught and rolled up by the turning drill rod. He was able to hold the rod from turning until freed a few moments later by another workman. He received bruises to his left arm. Loose clothing should not be worn on the job. Rain jackets or coats should have a button within one or two inches of the bottom. Miners should avoid contact with drill steels, which are rotating.

On January 12th at an underground coal-mine operation, a breakdown of the main ventilation system occurred when a broken shaftbearing resulted in damage to the fan. Mechanical ventilation was re-applied to the mine some 72 hours later when installation of a fan of similar size to the damaged unit was completed.

On January 12th in the trackless section of a large underground mine, two miners, at the end of their shift, reported the misfire of two bulldozes at a drawpoint from which they were mucking. Their report was made to the shiftboss supervising the area. The shiftboss went into the area to investigate the misfire, and found that the thermalite igniter cord had gone out. As he thought there was no one in the area, he relit the thermalite and immediately went to the surface. Two drillers working near the scene, after finishing their regular shift, got into their jeep and were driving out when the two shots went off. There were no personal injuries, but the concussion knocked three windows out of the jeep. They reported the incident when they arrived on surface. The shiftboss' blasting certificate was suspended for three months, as was his shiftboss certificate.

On January 13th in the surface shop of an underground mine, a mechanic was using the air-arc welding unit on a scooptram. The hose of the fuel tank was penetrated by the sparks, and unknown to the mechanic, diesel fuel accumulated under the machine. Pieces of molten metal fell into the fuel on the floor and ignited it. Three fire extinguishers were emptied before the fire was quenched on the floor, and on the machine. There were no injuries but damage to hoses and wires only. Shop personnel were reminded that all tanks of flammables must be emptied and flushed before doing any welding adjacent to them.

On January 13th at an open-pit coal mine operation, 20 000 litres of diesel fuel spilled onto the ground at a fueling station when a pipe was struck by fly-rock from a pit-blast. Drainage of the area was contained in a settling pond equipped with inverted decants.

On January 13th a drill operator suffered a broken leg when he was flipped by the electrical trailing cable of the drill as the slack was being taken out of it. He was apparently in the bight of the cable when the cable arm of the drill swung into the line of pull.

On January 17th in a crosscut of an underground mine, a broken and dragging brake pad of a scooptram generated enough heat to ignite flammables accumulated nearby. Two fire extinguishers were necessary because the fire became active a few minutes after the first extinguisher quenched it. This incident was discussed with all other scoop operators to alert them for this malfunction and the seriousness of the results. There were no personal injuries, with damage only to the brakes of the vehicle.

On January 19th at an open-pit mine, a pick-up truck stopped directly behind a shovel's trailing cable. The driver of a Unit Rig spotted the raised shovel bucket and proceeded to back into position. While backing, he hit the box of the pick-up truck. No one was injured but the box was damaged. It was pointed out that pick-ups should not park in the loading path of haulage trucks and shovel operators must not leave the dipper unattended in the hoist position.

On January 23rd on a service road at an open-pit mine, two 77-tonne Euclid trucks collided. One driver received bruises and contusions to his legs, and extensive damage was done to the cab of one truck. One truck was to be taken to the shop for repairs and the other was going up to replace it. The drivers were instructed to wait for a tractor to assist them on this part of the road which has a grade of 13 per cent. The driver coming downhill disregarded instructions, and continued down without assistance.

On January 26th at a large underground mine, the electrical wiring on a loaded scooptram caught fire. The operator braked the unit to a stop and tried to activate the fire suppression unit, which did not work. He then ran to the shop for help. Workers in the exhaust of the fire were warned to get out, and the small fire was extinguished by using a water hose. The maintenance foreman found that the emergency steering solenoid high-voltage wire had grounded on the frame after constant use and vibration had caused the insulation to wear away. The emergency steering lead was disconnected and the unit was taken to the shop for repairs. The fire-suppression system did not operate as no one had connected the nitrogen cylinder to the extinguisher. Preventive maintenance checks now require the checking of wiring. All units have had the suppression systems checked.

On January 29th at an underground mine, a workman was seriously injured by a fall of ground. The accident occurred while installing a drift set at the face of an exploratory decline. The accident is attributed to poor ground conditions and failure to recognize a dangerous situation.

On January 31st at an open-pit operation, under night-time conditions, a haul-truck operator, assuming he was under the guidance of a bulldozer operator while he was backing up to dump, backed too close to the edge before he realized the bulldozer was unoccupied. The rear wheels of the truck settled, and spill from the load damaged a power pole below. The line was de-energized before an attempt was made to recover the vehicle. No one was injured. The truck operator was disciplined for not following proper dumping procedures, and other drivers were reminded of their responsibilities at the dump.

On February 2nd at an underground mine, the tail car of the ore train derailed while travelling back into the mine empty. The derailed car knocked out timber sets, pulled down the trolley line, power cable and telephone line. There were no injuries. Investigation indicated a low spot in one rail caused the derailment.

On February 7th at a large underground trackless operation, a fall of ground of about 150 tonnes occurred beside a main roadway. Some rock rolled on to the roadway requiring clean-up before the crew could pass this caved section.

The fall had occurred on a relatively warm day which may indicate a freeze-thaw action. The heading is quite close to surface.

The heading has been shut down till timber crews are available to catch up the backs.

On February 10th at a large underground mine, a commercial carrier truck was struck by a loaded 12-car waste train, causing $2,000.00 damage to the truck. The truck was unloading freight, and the waste train was sitting awaiting the unloading operation to be finished before proceeding to the dump. The truck moved away, and the brakeman signalled the train to proceed. Suddenly the truck started backing up, and the train struck the front bumper and hood. There were no personal injuries. Communications between the train crew and the truck driver were obviously poor. Steps have been taken to correct this deficiency.

On February 12th at an open-pit mine, a truck driver backed a loaded 155-tonne Mark 36 Lectra-Haul truck over the dump. The truck went down the side of the dump for 9 metres into the water of the inlet. The practice at the mine is to dump the load 9 metres short of the edge of the bank, and to push the waste over the edge of the bank with a bulldozer. There were no personal injuries but the motor of the truck was extensively damaged. Subsequent tests revealed that the driver was severely impaired due to drinking alcohol.

On February 17th an air sample, taken in the return airway from a gob area of an underground coal mine, suggested that a spontaneous heating, in its very early stages, was present. Precautionary measures were taken to seal off the area with explosion-proof stopping, a task that was expected to take some five to six weeks. The return air has been continued to be monitored and, while increased levels of carbon monoxide have been detected, the levels as of mid-March had decreased to approximately 220 p.p.m.

On February 17th at a large interior underground operation, a special-use cart cabled to an eyebolt in the underside of a skip in a three compartment inclined shaft, struck a protrusion in the shaft and broke away from the skip. The cart fell nearly 60 metres when it jumped the track and lodged itself in the shaft timber. Damage was minimal and no one was injured. The cart had been fabricated in the shop to fit the shaft and weighed about 340 kilograms. When the incident occurred the unit was being given a test run at slow speed in the shaft. When the hoistman felt the "grab" he stopped the hoist immediately and notified the mechanics conducting the test. It was found that the obtrusion causing the incident was a shotcrete-repaired concrete shaft support which gave 2.5 centimetres less clearance than the rest of the shaft.

On February 20th in the crusher of an underground mine, the electrician put the main switch of a long conveyor belt in "off" position before beginning to work on the electrical control equipment. This "trouble-shooting" required frequent opening and closing of various circuits, and after each such alteration the main switch was engaged and disengaged. He found it very time-consuming to follow proper lock-out procedures, i.e. to actually lock both the handle and the door of the MCC room, after each try. He felt safe because there were only two other persons in the crusher, the crusher operator and a shiftboss, and both were instructed to stay away from the electrical controls. Hours later, a senior shiftboss entered the area and the electrician repeated his warning. Contrary to all he was told, the senior shiftboss was doing some checks of his own and, when the electrician left the area, he threw the main switch into "on" position to see what would happen. An electrical arc occurred and the person received flash burns to his eyes, face, and neck. All employees, including supervisors, have been reminded to follow proper lock-out procedures and have a competent person guarding electrical controls during repairs.

On February 23rd at an open-pit mine, the operator of an M100 Lectra Haul began to apply his dynamic brakes on starting down the ramp into the pit at 24 km/h. The dynamic brake pedal had no apparent effect. At 64 km/h he attempted to apply the air brakes. He made a second attempt to apply the emergency over-ride. When he flattened out on Bench 2890 he steered around the pit bottom until he struck the muck pile or toe which broke off the left front wheel. The truck travelled another 12 to 15 metres and buried its left front corner in the muck pile.

On February 23rd on the radio-controlled access road of an underground mine, a head-on collision occurred between a tractor-trailer unit and a station wagon. The driver of the truck claimed to have announced on the radio his position while approaching a blind curve, but the driver of the station wagon did not hear him and, assuming that no vehicle was heading in his direction, he neglected to report his own position. The truck travelled on the wrong (left) side of the road, hugging the inside of the curve. As the head-on collision was unavoidable, the driver of the station wagon dove to the passenger seat just before the impact. He received head and chest injuries but the seriousness of these were unknown as he left the country right after his release from the regional hospital. There was extensive damage to the station wagon. This serious accident was the result of: (a) both drivers were "driving by the radio", (b) neither driver practiced defensive driving, (c) truck drove on left, contrary to rules, and (d) speed limits were ignored.

On February 24th at an open-pit coal mine, a loaded explosives truck tipped over a small bench when the driver misread the end of a road barricade as indicating access to the blast area. The driver sustained only slight hand injuries. Conditions at the time of the accident were foggy with fresh snow on the ground.

On February 25th at a large interior underground mine, a trainee on a main-line trolley locomotive, when entering the loading chute area in the mine, increased power rather than cut power, panicked and lost control of the train. The trainee was under the supervision of the trainer, chief operator, and turned the control the wrong way. When the loci accelerated, he jumped up from his seat and applied the air brakes, but left the control in the full on position. The trainer was blocked from the controls by the trainee standing up, and could not shut off the power. The trainer finally turned the control to remote, which cut off the power. At this time the loci was travelling too fast too near the chutes, and both men jumped out. The loci crashed into the first chute, which sheared off the loci cab and controls. There were no injuries. To prevent a recurrence, a power over-ride and brake control system will be installed for the emergency use of the trainer.

On February 26th at a large interior underground mine, two fan blades were lost from a portal ventilation and heating unit which caused enough vibration to break the natural gas feeder line. A watchman noticed the vibration and shut the fan down, but did not think to shut off the gas. It was estimated that, with normal ventilation, gas leaked into the mine for about one hour. The mine was then swept with fresh air and checks made to insure safe conditions before night shift went into the mine. The alarm system on this fan installation was set to signal a flame-out when ambient temperatures are below 1°C. Because it was a warm day the temperatures were above 1°C, and the alarm did not sound. To prevent a recurrence of this situation, a vibration switch has been attached to the unit. A second look at the specifications of this type of installation is being made by the gas inspectors.

On March 1st at an underground copper, lead and zinc mine, a workman received fractures to bones in his left foot when a 400- by 10-centimetre P.C.V. sandfill pipe became dislodged from a tugger bucket and fell down a skipway striking the workman. The P.C.V pipe was not properly secured in the bucket before the hoisting operation commenced. A signal system has been installed to warn workers to stay clear of the manway and skipway while hoisting or lowering of material is taking place.

On March 9th at a large open-pit operation, a crane boom is believed to have come within .5 metre to .6 metre of an overhead 4160-volt power line during a manoeuvre to lift a beam at a pumphouse. Examination of the boom cable showed no contact had been made. However, a workman holding the cable hook alleged that he received a shock, and was sent for medical observation. He returned to work several days later.

On March 11th at an open-pit coal mine, the driver of a fuel truck sustained minor head injuries when the vehicle overturned in slippery road conditions. The driver was not making use of the seat belt.

On March 12th at an interior underground mine, a hung-up ore pass which runs parallel to a manway released suddenly. Tonnes of water-laden muck spilled out through an inspection sub into the manway, tearing about 30 metres of manway timber, and inundating the haulage level below. During spring run-off, extra water seeped into the mine, some of which ran into the ore pass during the weekend. To prevent a recurrence, hung-up chutes are to be immediately brought down and never left above inspection subs. Water control must be more closely checked. There were no personal injuries.

On March 15th at an open-pit mine, a grader's service brake failed after completing a "U" turn and pointing uphill in reverse gear, and the machine rolled back. The operator lowered the blade and jumped. The grader came to rest at the safety berm. There were no injuries and no damage.

On March 20th while hauling ore to the coarse ore bin, the loaded truck was permitted to free-wheel due to the inexperience of the driver. The vehicle, out of control, went over the bank and was completely demolished. The driver was thrown clear and suffered only minor bruises. Investigation by the inspector indicated that the brakes were operative but had not been applied. A driver-training program, and drivers with necessary experience, has been recommended.

On March 20th at an open-pit mine, while performing hydraulicking tests on overburden removal, a victaulic fitting parted in a 25-centimetre water line. Compressed air trapped in the dead end of the line propelled the pipe about 15 metres along the ground. There were no injuries or damage. It was found that the victaulic fitting had not been properly seated. All joints were checked to insure they were correctly installed.

On March 21st, due to a breakdown in lock-out procedure, a welder who had not installed his lock, suffered minor bruises and shock when crowded by the bucket of the 191M Marion shovel against his service truck. Lock-out procedure once again has been emphasized to all pit maintenance personnel.

On March 23rd at a large open-pit copper mine, a 60-tonne Terex truck backed over a three-metre lift at the waste dump. The operator, on backing to dump, put one wheel over the berm before the brakes were applied. The truck slid down until it reached the bottom of the lift. There were no injuries or vehicle damage. The brakes were checked and found correct. The driver was reprimanded for improper dumping procedures.

On April 4th while dumping an ore train on surface, the 4-tonne car being dumped at a "camel-back" failed to hold the track and overturned, pulling a second car and the locomotive over the hillside. The operator jumped clear, suffering minor injuries. Modifications have been made to the wheel guard, and operators will receive additional training.

On April 9th on the radio-controlled access road of an underground mine, a company bus with 18 passengers lost traction on a steep grade. The road at that time was covered with heavy, wet snow. The driver had stopped at the first steep grade to put on tire chains but found that the chains were too short and decided to carry on without them. He had no problem until negotiating a steeper grade further on, where the bus lost traction, spun out, and could not be held with its brakes. The driver decided to reverse, staying close to the mountain in order to stay away from the cliff on the other side of the road. The right rear wheels dropped into a small ditch, and the side of the bus, at the window level, hit the wall of rock and the bus came to a halt. There were no injuries.

On April 12th at an interior open-pit mining operation, a loaded Wabco 32-tonne Haulpak truck was driven along the soft verge of a haul road to avoid a graded windrow in the centre of the road. The outside wheels slowly sank into the soft shoulder and the truck rolled over on its side. No injuries were sustained, and damage was minimal. Drivers were subsequently cautioned to keep clear of the road shoulder, and where necessary, straddle any windrows.

On April 17th at a large open-pit mine, an M-85 Lectra Haul truck crossed the road to the berm side, ran up the berm and back down with the side of the truck hitting a power pole and breaking it. The operator caused the accident by falling asleep. There were no injuries and the only damage was a broken power pole.

On April 18th at a quarry operation, a tractor truck which had been parked in the truck park area for 12 hours was found to be on fire. The truck had been operated on the day shift on April 17th, had been serviced, lubricated, and placed in the parking stall at 6 p.m. The foreman had patrolled the truck park area at 4 a.m. on April 18th and everything appeared to be in order. It is believed that a short circuit developed in the truck wiring.

On April 20th at a quarry operation, a driller, using the quarry pickup truck, joined the front-end loader operator for coffee break. On resuming work, the loader operator was not aware that the pickup had not been moved, and backed up into the pickup, damaging the radiator and grill of the pickup.

On April 20th at a large gravel pit, a workman sustained multiple lacerations, numerous fractures and severed tendons to his right hand. The accident occurred when the workman, while climbing onto the metal framework near the head pulley of an operating belt conveyor, slipped, and grabbed an unguarded multiple V-belt drive, which was situated 2.4 m above ground level. His right hand was pulled through the drive motor pulley.

On April 23rd at an underground mine, a workman was squeezed between timber and a Cavo loader while using the loader to haul out some longhole gear. The workman received a fracture of the pelvis. This development drift had sufficient room for the operator. However, instead of taking the machine in forward to pick up the longhole gear, the workman reversed the machine around and went in backwards, straddling the ruts made by the loader while mucking. The machine slipped into the ruts and squeezed the workman.

On April 24th at a large open-pit copper mine, a dangerous occurrence took place which involved explosives. After finishing and tieing a blast pattern, eight relays, which were not used, were placed in the cab of the vehicle, and the vehicle given to another worker. The worker parked the truck near the camp area and the relays, which were in a tube, fell out and were found by a millworker who gave them to his foreman to be turned over to pit personnel for storage approximately four hours later. There were no injuries involved with this unusual incident, and the people concerned certainly realize what could have happened had some irresponsible person found them.

On April 26th in the underground fuel storage area of an underground mine, two employees were transferring diesel fuel from a mobile tank car to two 45-gallon drums. In order to accelerate the built-in handpump they applied compressed air and de-activated the tank car's pressure release valve. The tank car ruptured and about 150 gallons of diesel fuel spilled. There were no injuries.

On April 28th at an underground and surface mine, a blast was set off to enlarge the storage chamber in an ore pass leading to the open pit. The blast was approximately 120 m down from surface, and the bottom part of the ore pass was plugged with muck. The top of the ore pass had a bulkhead (2.4 m × 2.4 m timber and 50 mm planks) used for placing grizzley rails. The concussion from the blast blew the planks of the bulkhead and scattered fine muck over a Terex loader working approximately 36 m from the top of the ore pass.

On April 30th at an open-pit mine, a drill was lost over a bench. The operator had set up the drill but could not get any rotation. He went for a mechanic. The drill moved and fell over the edge of the bench. Examination found the clutch to be partially in reverse, and although this was insufficient to turn the tracks initially, after warming up, the tracks apparently were engaged. The unit was irreparably damaged, but there were no personal injuries.

On May 2nd at an open-pit coal mine, the driver of an empty truck incurred scalp lacerations and a hairline fracture of a cervical vertebra when his truck crossed the roadside berm, rolled once, and landed on its wheels on the road below. Investigation showed that the truck approached the berm at a very shallow angle and that no evasive action was taken by the driver.

On May 3rd at a large open-pit mine, a 60-series GM truck, carrying a water tank and travelling too fast, overturned when attempting to turn on loose gravel. There was considerable damage to the cab, and the operator and passenger received multiple bruises and glass cuts. The driver was reprimanded. The maximum speeds for vehicles are to be posted inside the vehicles.

On May 4th at a large open-pit copper mine, two Lectra Haul rigs (production haul trucks) were in a minor collision, due to one of the operators falling asleep momentarily. Light rain was falling at the time but was not considered to be a factor as visibility was good. There were no personal injuries, and damage to the units was minimal.

On May 8th at a copper-lead-zinc mine, a 27-tonne Haulpak production truck was inadvertently backed over a stop log which allowed the rear wheels to drop in the storage bin above the surface crusher. The ore had to be removed by hand and approximately four hours later the vehicle was removed from the bin. No injuries were incurred and damage was minimal. An additional stop log has been installed so a repeat of this unusual incident is not likely to happen.

On May 9th at an underground crusher, a spill of water and wet muck occurred causing damage to guard rails and crusher grease line. It was found that the upper control chains were anchored in the open position which allowed the muck no resistance, consequently overrunning the crusher. There were no injuries.

On May 10th at a large open-pit copper mine, an A60 RBE drill inadvertently backed over some "D" cord and procore primers which had been placed on a blast pattern by the blast crew. The further movement of the drill was immediately halted and the supervisor was notified. The drill and blast foreman directed the drill off the cord and primers without incident. A meeting was called and all personnel concerned were notified of procedures to be undertaken when a drill is required to operate in close proximity to a loaded or partially loaded pattern.

On May 11th at an underground mine, wet muck from a mucking machine drawpoint flooded the main drift. The workmen noticed the muck starting to flow, and removed the train from the area. An investigation showed that an accumulation of water making its way through the muck allowed fine muck to run out into the drawpoint causing this accident. There was no damage to equipment and no personal injuries.

On May 14th at an underground mine, a slough occurred in a longhole stope which was open to surface. The slough forced air through the drawpoint which had not been in use for two years. The forced air damaged three timber bulkheads. There were no injuries.

On May 15th at an open-pit operation, two similar electrical faults developed in the concentrator M.C. centre during "racking in" procedures, which caused outages totalling 75 hours, and also some burns to the person "racking in". The first fault was attributed to a faulty vacuum contactor which was "racked in" with the main power contacts closed. The second failure was attributed to carbon tracing precipitated from the first fault. Following a review of maintenance and operational procedures, the company implemented a course of action to minimize outages and reduce the exposure hazard to the person who racks "in" or "out".

On May 19th at a large underground mine, four men were required to guard when blasting a large rock which was jammed in a chute. The shot was prepared on the rock, and a .9 m fuse assembly and .30 m of igniter cord were used to detonate the charge. When all was ready the igniter cord was lit and the guards went to their posts. The shot went off approximately 20 to 30 seconds after the igniter cord was lit. The incident was reported, and several other assemblies from the same roll were tested and found to burn at a normal rate. In future, remote blasting will be done in all instances at this mine.

On May 31st at a small open-pit mine, a Terex dozer was damaged when struck by loose ground falling off the bench wall, while the operator was pushing broken muck off the bench below. Although the operator was struck with small pieces of rock and glass, there were no apparent injuries.

On June 1st at an open-pit mine, two Terex Model 33-65 trucks collided at the loading area during shovel loading operations. The accident occurred when an empty truck attempted to back into loading position before the loaded truck was in the clear. The cause of the accident was attributed to operator error. There were no injuries and damage was limited to the radiator on one truck.

On June 2nd at an open-pit coal mine operation, a 32-tonne truck went out of control and ran off the road. The driver sustained bruises to the ribs and head abrasions. Investigation showed that the truck's engine stalled and that the driver failed to take appropriate action by using the emergency steering and brakes.

On June 7th at a large interior underground mine, a blasthole loader entered his working place without checking the conditions of the atmosphere. A blast had been made in the heading five hours earlier. When he did not return in approximately 15 minutes, his partner went in after him and found him unconscious on a raise platform. After checking vital signs the partner retreated and got two timbermen to assist in bringing the overcome workman out to fresh air and oxygen therapy. The worker was taken directly to the hospital where he spent several days recuperating. CO and NO readings were taken in the heading after the incident. CO ranged from 100 to 1500 ppm while NO and NO_2 in one location was 5 ppm. None of the people involved thought of using their W65 Self-Rescuers nor did they consider the possible results of entering such an atmosphere without ventilation or rescue apparatus. Workers have been upgraded in mine rescue and gas detection along with the enforcement of ventilation requirements since the incident.

On June 10th on an open-pit coal mine access road, a truck ran out of control when the dynamic brakes failed. Due to inexperience (two days only) the driver failed to make use of his service brakes and a nearby runaway lane. The truck struck the protective berm on the side of the road. No injuries were sustained.

On June 16th at an underground coal mine, two dozer operators sustained minor cuts and bruises when the ripper of one machine ruptured a natural gas pipeline near the surface facilities of the mine. The ground was being scarified prior to reclamation seeding.

On June 16th at an open-pit mine, a shovel was proceeding down the ramp to the bottom of the pit, when the power tripped out. The shovel began to roll and went 90 m. There were no injuries or equipment damage. On checking it was found the solenoid had malfunctioned, which was replaced.

On June 21st at an underground coal mine, a roof failure occurred in a newly driven portal. The heading was noticed to be taking weight and work had been started in removing machinery. The shuttle car and continuous miner were recovered two days later with minor superficial damage. There were no injuries. The cave continued to surface within 6 m of a stream located in a steep-sided bed.

On June 28th at an open-pit coal mine operation, the driver of a water truck bailed out of the vehicle when the engine stalled while descending a seven per cent grade. The driver, who sustained abrasions to his arms and legs, stated that he was unable to control the vehicle by the use of the brakes and auxiliary steering.

On June 29th at an adit of an underground mine, the locomotive, cars and operator went over the dump when the hold-down from an 18 cubic metre Granby car slipped off a camelback dump block. The operator received several bruises and one broken rib. The batteries of the locomotive were damaged. On investigation, it was found that the outside rail track had settled one inch or more.

On July 2nd in the mill of an open-pit mine, the belt of a bucket elevator caught fire. Maintenance personnel were replacing a head pulley shaft, and to achieve this, part of the chute had to be cut away. The area was wetted down and one person stood fire watch. Approximately one hour after the chute had been cut, smoke was noticed coming from the bucket elevator. The fire was put out with the aid of extinguishers and a water hose.

On July 5th at a large open-pit mine, the operator of a 213-tonne haul truck felt an unusual movement of the truck when backing to a dump-short position. He realized the dump was sloughing and abandoned the vehicle. The dump surface subsided approximately 1 m to 3 m in the vicinity of the rear of the truck. The toe of the dump had recently been loaded to prevent sloughing. Examination of the slough fracture line showed snow and mud sections which were apparently covered during spring break, and probably contributed to the failure. The toe is now being loaded to a higher elevation to stabilize the dump. There were no injuries.

On July 7th at an underground mine, a break-through round of an Alimak raise was blasted through to a sublevel without guards being placed at the entrance of the sublevel. A mechanic who was not aware the blast was going to take place was working approximately 167 m from the blast. There were no injuries.

On July 17th during barge-loading operations at a limestone quarry, a mechanic suffered a fracture of the tibia just below the knee when his pantleg was caught in an unguarded multiple-power-band V-belt drive. He had stepped in front of this V-belt to lean over the barge-moving winch in order to correct the "spooling-off" of cable from the haulback winch drum.

On July 18th during the process of dismantling the No. 5 compressor at an underground mine, the 1.27-cm sling failed, and the hoist drum, motor, and cross trolley fell to the floor. It had been noted that the mounting legs for the aftercooler were still partially embedded in concrete, and even though the mounting bolts were removed, the retention of the legs may have caused the mishap. Previously No. 6 compressor had been dismantled in the same manner with the same equipment. There were no injuries.

On July 26th at an open-pit mine, sparks and hot metal from a burning torch being used on a mechanic's service vehicle started a fire. Efforts to extinguish the fire with fire extinguishers failed, so the vehicle was pulled out of the shop. Fire completely destroyed the vehicle, but there were no injuries. Fire-fighting procedures are being reviewed, and a refresher course in the use of fire extinguishers is scheduled.

On July 28th at a large gravel-pit operation, an employee received severe lacerations to the sole of his left foot when a large rock jumped off a reject grizzly, which he was attempting to clean, and fell on his instep with enough force to cause the injury. It has been recommended that persons not be allowed to attempt to release hang-ups such as this unless they are standing in a safe position on the platform provided. It has also been recommended that the skirting along both sides of the grizzly be raised another 20 cm.

On August 2nd at a large open-pit mine, a worker narrowly missed being splashed with cyanide when the valve starting the cyanide flow was opened. The valve was opened in error by the operator who wrongly opened the line thinking everyone was clear. Since the accident a lock-out system has been installed.

On August 4th at an open-pit mine, the trailing cable to the B.E. 45-R drill tripped the switch-house. When the cable was re-energized there was a crack similar to a .22 calibre shot, and a flash as the switch-house again tripped. The fault was 22.5 m from the drill, and 60 m from a completed pattern. There were no injuries but it reinforces management position as to the rule (no trailing cable within 7.5 m of loaded holes).

On August 8th at a large open-pit mine, a sulphuric acid line was damaged when it was driven over by a ready-mix truck, on completion of a pour. Approximately 6.8 L of acid spilled onto the ground before the supply was turned off. Fortunately, the acid drained into a tailing storage impoundment. The spill area was flushed with fresh water and neutralized. There were no injuries.

On August 10th at an underground mine, the ore train coming from underground to dump, lost one ore car which derailed causing damage to the track shed. The ore car, while passing a switch, lost two wheels on the same side causing the derailment. There were no injuries.

On August 10th a fire occurred in the powerhouse of an open-pit mine. While filling the day tank for a power unit, the day tank overflowed and leaked oil on a worker using a cutting torch. The second worker, who was assigned to watch for fire, went to correct the oil leak but did not stop the worker from cutting. There was extensive damage, and one worker received minor burns to the hands.

On August 12th on a haul road at an open-pit coal mine operation, a 155-tonne truck went out of control, and rolled 30 m down an embankment. The driver stated that the steering had locked. He made no use of the vehicle's service brakes or emergency steering system while travelling a distance of 107 m on level ground, from the point of steering-lock to the point where the vehicle left the road. The driver sustained bruised ribs and minor lacerations.

On August 18th at an open-pit copper mine, the operator of an air track drill had his left thumb and index finger badly crushed. He had just finished drilling a hole, and was at the controls proceeding to move to a new location when the main cross member broke, causing the machine to collapse inward jamming his hand on the controls. No fault was found with the operator but it is now evident that metal fatigue had started previously and non-destructive testing of all major support members has been recommended on an annual basis.

On August 30th at an underground mine, a shaft conveyance was inadvertently moved while workers were in the shaft using the conveyance as a working platform. A few hours prior to this incident an electrician had been called in to repair the automatic controls of the friction-type hoist. Later during the shift the same electrician called the cage to go to another level for repairs unrelated to the hoist, and when the cage did not respond to repeated calls, he assumed the controls to be at fault again. He proceeded to the hoist room, and when a visual check of the shaft did not indicate any work in progress, he unlocked the control panel and overrode the "hold" position in the cage controls, moving the conveyance to another level. The two workers in the shaft manway were uninjured, and no damage occurred to the shaft or cage. The use of signs at shaft stations and hoist room control panels, in addition to further lock-out protection, is now required by management when men are working in the shaft.

On August 30th at a large surface operation, a capacitor failed on a power shovel, and 2 to 3 L of pyranol (PCB) leaked out. The unit was replaced, and the faulty capacitor, contaminated materials and clothing were sealed in plastic, placed in a steel drum, and shipped to Kamloops for disposal. The cause of the capacitor failure has not been determined.

On September 6th at a large open-pit mine, a loader was parked on a grade while the operator left for his coffee break. When the lube serviceman mounted the machine to service it, the emergency brake released, and the machine rolled backwards down a grade. When his efforts to stop the machine failed, the serviceman jumped clear. The loader continued rolling backwards until it went over the edge into a ditch at the side of the main haulage road. It was recommended that all mobile equipment be parked on level ground, and where this is not possible, wheels should be chocked and the machine run against a bank. It was also recommended that servicemen be familiar with the parking controls.

On September 7th in the concentrator of a large underground mine, a low concentration of H_2S gas was generated when HCL was added to the lead filter boots when preparing the filter cloth for an acid bath washing. The gas was monitored by an automatic readout device at 5 ppm which triggered an automatic alarm signal. Some workers in the area were not aware of a possible danger as they did not know what the alarm was for. A training program was immediately started to acquaint all workers with the evacuation procedures to be followed when the alarm sounds. More H_2S signs will be posted in the area.

On September 11th at a large open-pit mine, subsidence of the main haul road, and indicated failure in the walls in the area of subsidence, necessitated immediate closure of the pit area below. A consultant's report was being prepared and further mining will await the findings of this report.

On September 11th at a large open-pit mine, the front spindle sheared off a haulage truck as the brakes were applied when parking. Slide marks of 3 m point to the fact that the vehicle was going too fast and applied the brakes. The broken spindle was sent for testing. Spindles will now be checked every three months.

On September 13th at an open-pit mine, a 59-tonne Terex loader came in contact with an energized powerline carrying 4160 volts. There were no injuries and damage consisted of two wires being broken. The front tire of the vehicle was losing air and the operator raised the box to take the weight off the tire, and proceeded to the shop. Previously there had been sufficient clearance for trucks to pass under the overhead line. However, during the course of years the road had built up so that the arch hook caught the bottom two wires. To prevent a recurrence, operators are to be forewarned, signs are to be posted to have boxes lowered, and a longer pole to be installed to increase clearance.

On September 18th an ignition of methane gas occurred at a development heading in an underground mine. No injuries resulted. The prompt action of the operators in extinguishing the flame, and the excellent standard of ventilation prevented a more serious occurrence.

On September 19th at an operating limestone quarry, a .8-tonne pickup truck sustained substantial damage when it rolled over the edge of the 1785 bench and came to rest on the 1750 bench. The vehicle had been serviced on the 1785 elevation, and had been left unattended with the transmission in neutral and without the emergency brake set. There were no injuries. Vehicle-servicing procedures have been revised.

On September 20th at a large open-pit mine, a boom truck carrying a suspended load was elevated more than normal to give ground clearance. The operator did not check his boom clearance, and the boom caught a steel messenger cable, subsequently pulling over a power pole. Power was disrupted as the breaker tripped immediately. No injuries resulted.

On September 25th at a large open-pit mine, the trucks were being lined up in preparation for the oncoming shift. A 59-tonne Terrex loader made a counter-clockwise turn and backed up blind, running into the front of a second 59-tonne Terex loader. The prescribed method is to make a clockwise turn. The operator was reprimanded.

On September 26th at a large open-pit mine, a fork-lift truck which was used for tire assembly, suddenly dropped the tire assembly and tire to the ground, while lifting a tire. The pins holding the right and left hoist chains had sheared through their respective connectors. It was noted that this was a common failure in this machine, and it was recommended that daily maintenance include a routine check of the attachment that failed. There were no personal injuries.

On September 27th at a large open-pit mine, the operator of an electric crane received an electric shock when he picked up the control box. It was determined that the steel cable supporting the pendant control came in contact with an uninsulated portion of bus bar in the power supply to the crane.

On September 27th the counterweight of a shovel, working in an open-pit coal mine, struck a dozer which had entered the swing area. No injuries resulted.

On September 30th in an open-pit coal mine, a haulage truck struck a pickup truck which had entered the work area. No injuries resulted.

On October 1st at a large open-pit mine, a 59-tonne Terex truck was backed into the front of a 77-tonne Lectra Haul truck. There were no injuries and very little equipment damage. The accident was caused by the driver of the Lectra Haul not following proper procedure. He should not have advanced his position at the shovel, and also should have been on the other side of the shovel. The operator was reprimanded.

On October 2nd at an open-pit mine, the driver of a Lectra Haul truck dozed off and the vehicle went off the road. Fortunately the truck was going slow and there was a good safety berm. There were no injuries or damage to the vehicle. The driver was reprimanded.

On October 3rd at a large open-pit mine, a millwright cut a hole in the coverplate of the cyclone underflow launder. Five minutes after he had gone, smoke and flames were noticed, and the alarm was raised. Several members of the crew got fire extinguishers, and their efforts were partially successful but smoke forced them back. Shift operators started the cyclone feed pump, and this water, plus the sprinklers, quenched the fire. A small blower was used to disperse the smoke, and two persons wearing Chemox apparatus checked the area for smoke victims. Inspection showed that the rubber lining adjacent to the hole had caught fire. Fire prevention methods regarding welding and burning are now under review.

On October 4th at a coal mine operation, a truck-mounted exploration drill overturned while it was being moved down a road. No injuries resulted.

On October 4th at a large open-pit mine, a pick-up truck went over a bank on the right side of the road. The truck rolled over on its top in the ditch 3 m below the road. The cab was badly damaged, and the operator received a bruised shoulder. The operator was reprimanded for driving without due care and attention.

On October 5th at an open-pit operation, in the normal shovel ground-fault check out procedure, a test jumper and Amprobe meter were attached between one phase at the pothead and the substation grounding system. When the test was made the fuse in the jumper blew causing arcing at the pothead, which resulted in burns to the hand of the electrician standing nearby. It was discovered that the fuse current rating was too low, and that the control relay did not respond quickly enough. When these were corrected the system apparently operated satisfactorily. Another system of ground-fault checking has been proposed and will be implemented when parts are received.

On October 6th at an interior open-pit mining operation, a supervisor drove his pick-up over an 8 m embankment on an unused mining road. Part of the road had been removed and sent to the concentrator as it was low-grade ore. The resulting embankment was temporarily guarded with sawhorses, but someone had removed several of these for other purposes. Access to the area of the accident was over a steep rise where the hood of the truck prevented the driver from seeing the road. When the driver could see the road he applied the brakes (skid marks were visible), but it was too late, and the truck went over the embankment, rolled over, and came to rest on its wheels. The driver suffered minor lacerations to his head, a bruised chest, and a slightly stiff neck. The road has since been blocked with piled gravel and crushed rock.

On October 7th at an open-pit mine, an M-85 Lectra Haul truck overturned when the operator lost control on a 7.7 per cent grade. The accident was attributed to faulty diesel injectors which caused the engine to cut out, and to a suspected failure of the auxiliary steering pump. The operator received cuts and bruises, in addition to a fractured collarbone. The use of the seat belt would likely have prevented or minimized injury to the operator.

On October 11th at a large open-pit operation, a mechanic backed a large truck out of a shop without first ensuring that it was safe to do so. Because of the lack of suitable clearance, the truck damaged the shop door. There were no injuries, although another person narrowly escaped injury when he attempted to remove a steel chock that the truck was about to run over.

On October 12th at an open-pit coal mine operation, a Wabco 120B truck went out of control when the driver fell asleep at the wheel. The vehicle came to rest with its right-hand wheels in the ditch alongside the road. There were no injuries.

On October 17th at an open-pit coal mine, the driver of a mine-haulage truck sustained a broken foot when he jumped 3.6 m from the deck to the ground as a second truck backed into his vehicle.

On October 18th, while working on the construction of a tailings dam for a large open-pit mining operation, a scraper hauler became stuck on the edge of the dam, and was subsequently overturned when attempts were made to free it. Damage to the scraper was slight, and no personal injuries were sustained in the incident.

On October 21st at a large open-pit mine, a supervisor had locked out power on two machines to change cables. Two men were reconnecting the pothead. The supervisor asked a third man if everything was "okay" and he replied that it was. The supervisor radioed to turn the power on, and it was found that the pothead was still being connected. In future, the wrenches for potheads must be given back to the supervisor before the power is turned on.

On October 28th at an open-pit coal mine operation, a pick-up truck was struck by a mine-haulage truck. There were no injuries.

On October 31st at an underground operation, a labourer received a broken jaw and head lacerations while attempting to clear an air line of ice on the 1700 level portal. The air had been turned off on the surface line at the 2600 level leading to the 1700 level, but no one seemed to realize that the air lines are looped via underground and surface lines as far as the 2200 level. Consequently, the 1700 air line was under full pressure when it was opened at the 1700 level. As soon as the ice was cleared the blast of air tumbled the worker several feet downhill.

On November 1st at an open-pit cement quarry, a series of 20 holes were loaded and wired for electric blasting. When the blast was fired only seven of the 20 holes detonated. No apparent cause was found for the misfires, and instructions for drilling relief holes were given to all persons concerned in order to get the blast fired properly.

On November 2nd at an open-pit coal mine, a portion of an active waste dump failed, and moved downhill. There were no injuries.

On November 5th a scooptram ran out of control for 39 m on an underground access ramp and crashed into a safety bay. The operator suffered severe bruising to his left thigh, and the scooptram bucket was damaged. The cause of this accident has not been attributed to mechanical fault or other equipment failure, and the possibility of operator error remains under investigation.

On November 6th at a large open-pit operation, the driver of a large haul truck reversed his unit towards the shovel without being fully aware of his position in relation to the shovel. Fortunately the shovel operator was able to signal the truck driver in time to prevent a collision.

On November 9th at an open-pit coal mine, a portion of an active waste dump failed. No personal injury or property damage occurred.

On November 10th while hauling from a quarry, a loaded Mack RL686L tractor trailer, carrying 6 tonnes of limestone, was driven onto a soft shoulder of a main highway, rolled over down a 4 m embankment, and came to rest upside down. The cab of the tractor and the engine are irreparable, and the trailer suffered only minor damage. The driver, on his second trip of his shift, claims he momentarily dozed, and found himself in trouble. He was not wearing his seat belt, and was able to climb out the back window of the cab unassisted. He suffered only minor injuries, plus a cracked shoulder blade. He further stated that he had been suffering from a cold for a week or so and was taking medication. All drivers have since been cautioned that, should they feel drowsy at any time, or any other momentary inattention while driving, they are to pull off the road, rest and get fresh air. They were also cautioned that they should wear their seat belts.

On November 15th at the start of the daily single working shift, the underground manager found that the main electrically driven ventilation fan had stopped because of an interruption in the electrical supply to the fan. The fan was restarted at about 7 p.m. on November 15th, after a new cable was installed. Normal underground working was resumed on the day shift of November 16th. The investigation revealed an earth fault in the buried power cable to the fan. The cable was probably damaged during the digging of a trench near the cable, though the possibility of ground movement over the cable, caused by heavier-than-usual vehicular traffic, cannot be ruled out.

On November 15th at a small open-pit mine, the shed covering the collar of a raise collapsed when a 6 cubic metre loader inadvertently drove over the roof of the shed which was constructed with native round lumber. One workman, who was supposedly directing the operator of the loader, was slightly injured.

On November 16th at an equipment repair shop of a large surface operation, two mechanics were compressing one of the rear suspensions of a Mark 36, 154-tonne Lectra Haul truck with two 5-tonne lever hoists. The body of one of the lever hoists broke and flew out, with a piece striking one of the mechanics, and causing minor facial injuries. The hoist has been returned to the manufacturer for study as there is a machined area on the body of the hoist which may have contributed to the failure.

On November 16th at a large open-pit operation, an employee sustained lacerations to his right toe when a forklift he was operating overturned. He lost control on a 10 per cent grade, and was thrown off the unit with his right foot being caught underneath. The unit was equipped with ROPS and a seat belt but it was not used.

On November 21st at an open-pit coal mine, a heavy-duty mechanic sustained a fractured elbow and a fractured rib when he fell to the ground while prying on the friction disc of a bucket shovel.

On November 22nd at a large surface operation, a collision occurred between two 109-tonne Lectra Haul production trucks. The operator of the first truck backed into the load box of the second truck, which was being backed into the L-700 loader pattern. The cause of the accident was attributed to the driver of the first truck, who failed to look into his right back-up mirror to be sure he had a clear path.

On November 22nd at a large underground mine, the main hydraulic hose on an ST5 Scooptram broke, spraying fluid onto the hot engine. As the fluid used was Aquacent Light FRF, the ensuing fire was very weak, and the operator had time to activate the fire suppression system. Damage to the machine was minimal and it was back in operation the following shift. There were no injuries.

On November 25th at a large open-pit mine, while a Lectra Haul truck was being loaded, the ground shifted under the rear wheels of the truck causing it to tip on its side, striking the shovel on the way down. The accident was caused by loose muck giving away causing the truck to overbalance. There were no injuries and minor damage to the vehicle. It was recommended that the shovel operator be retrained.

On November 26th at an open-pit mine, failure of an overburden dump resulted in an M-100 Lectra Haul being partially turned over when it was carried approximately 9 m with the muck slide. It was recommended that, where dump stability is in doubt, a substantial rock toe-berm be constructed and that trucks dump short of the crest.

On November 29th at a large surface operation, an operator of a 4.5-tonne forklift was driving along a road on a descending 4 per cent grade. The vehicle struck a bump in the road, bounced twice, and rolled onto its right side. The operator sustained minor injuries to his right elbow and forearm. It was determined that the forklift is not suitable for road travel, and will be restricted to the immediate mill area.

On December 1st at an open-pit coal mine, the driver of an empty haulage truck lost control of his vehicle on an 8 per cent down ramp, went through a roadside berm, and down a 5-m embankment. No injuries resulted.

On December 1st at a large surface operation, a pickup truck collided with two 12-m lengths of rubber-lined steel pipes which were being transported by a forklift. The cause of this accident was attributed to carrying a protruding load after dark, without the use of a pilot car or signal guards. The driver of the pickup truck received a broken nose and facial lacerations.

On December 1st at a large surface operation, a collision occurred between two 109-tonne Lectra Haul trucks. One vehicle was backed up approximately 50 m and struck the side of the cab of the other vehicle. Investigation revealed that there was no reason to back up at that time, and that the operator had also failed to look at the right rear mirror.

On December 4th at an open-pit coal mine, a drill operator sustained contusions to the left knee while attempting to quickly vacate the cab of a drill. The safety bar failed to hold a steel drill which had broken away from the rack.

On December 5th at an open-pit coal mine, a mine haulage truck went out of control and struck a roadside berm. No injuries resulted.

On December 12th at a large surface operation, the nose cone, and rear wheel and axle assembly separated from the main structure of a Mark 36, 154-tonne Lectra Haul. The nut which holds the pin had backed off and allowed the pin to drop out. It is probable that the two 1.9-cm-long welds which are used to tack the nut to the pin will be increased to 2.54 cm on the top and 5 cm on the bottom. Keeper plates are also being considered.

On December 12th at a large open-pit mine, three workers proceeded to move a power cable from under the snow. It was noticed that a D-8 caterpillar had run over the cable, damaging it. There was a flash, and one man received an electrical shock to his leg, although it was not burned. There was also a power outage. It was determined that more quadropods are to be used, and the cables made more conspicuous.

On December 13th at a large open-pit operation, a cable on the 9-tonne overhead crane failed while hauling a ball charger with a load of balls, at an estimated weight of 2 250 kg. The load was being raised when the limit switch failed, and the block pulled into the drum, shearing the cable, and causing the load to drop. Considerable damage was done to the grating on the floor.

On December 22nd at a large open-pit mine, the operator of an empty M-85 Lectra Haul truck was proceeding down the ramp into the pit. In the first 300 m the dynamic brakes behaved normally. The brakes released on the flat section, and would not re-apply. The speed was up to 48 km/h before the operator realized this. He thought the overspeed dynamics would come on at 50 km/h, but they did not. He decided to ride it out. At approximately 150 m the ramp climbs back up. At 72 km/h the overspeed dynamics did come on. The operator's reason for not applying the service brake was that he thought he would skid across the ramp. The operator was reprimanded for not following emergency procedure. The speed at which the overspeed dynamics comes on has been lowered to 45 km/h, and emergency procedures have been re-emphasized.

On December 23rd at a large open-pit mine, the operator of an M-85 Lectra Haul truck was returning to the pit from the crusher. At the crest of the ramp the operator applied the dynamic brake and found very little stopping power. He released and tried again, with no response. He held the dynamic pedal down, and pushed the master breaker override switch, but there was still no dynamic brake, so he depressed and held the service brake until he came to a stop. His speed was 56 to 64 km/h at the time he applied the service brake. The vehicle came to a stop 10 to 15 m from the wall at the side of the ramp. The cause of the malfunction was a broken potentiometer on the dynamic brake.

Dangerous Occurrences, 1979

On January 2nd at a large surface operation, a workman sustained severe tissue damage to his right hand and forearm which was caught between a conveyor belt and head pulley. The workman was applying a spray-type belt dressing to the head pulley at the time of the accident.

On January 4th at a large open-pit mine, the operator of a mobile crane was making the last connection to the dead crane battery. When he touched the positive cable to the positive battery post the battery exploded. He was wearing his safety glasses and received only a minor cut on the bridge of his nose. There was either ice in the battery or reverse polarity. A written and diagrammatic procedure has been prepared for distribution and discussion at safety meetings.

On January 5th at a large open-pit mine, a mobile 45.5-tonne hydraulic crane overturned. The accident was attributed to exceeding the allowable load-chart ratings. It was directed that loads must be maintained within recommended limits.

On January 6th at the tailings dam of an open-pit mining operation, a D-8 dozer rolled onto its side while working on the cut side of an access ramp. No injuries were sustained by the operator and no damage was done to the dozer. The operator was experienced but was not wearing a seat belt at the time of the incident.

On January 7th, unauthorized experimenting with dangerous chemicals in the assay laboratory resulted in a series of minor explosions. Education of personnel and better laboratory security was recommended.

On January 7th at a large open-pit mine, a steam condensate tank ruptured, and the top of the tank was blown off breaking a reagent line. There were no injuries. An investigation revealed that the tank had been adequately vented but that the line to the outside had frozen, and the second line had unknowingly been plugged. Changes to the vent system have been made to ensure proper relief of any pressure buildup.

On January 11th at a large open-pit mine, a minor fire occurred in the used oil storage tank located under the floor of the pit shop. The fire occurred as a result of welding sparks entering the waste oil drain pipe and igniting the gases which had accumulated therein.

On January 12th at an underground mine, the operator of the trolley had switched off the main line to hitch up and pull another trolley and car, which had come out of shop after receiving repairs. The operator proceeded to move the trolley into the area, when the trolley pole jumped and hit the hanger, causing arcing to take place, and the trolley line to fall onto the ore cars. The power shut off, and the switch was pulled immediately by a trolley operator. A fire extinguisher was used on the trolley line guards. No injury resulted to persons involved. An investigation was made into the incident and the findings lead to the conclusion that the pressure put on the trolley pole by the operator taking the trolley too far off the main line was the cause of the mishap.

On January 15th at a large open-pit operation, a tote box loaded with balls weighing approximately 7 tonnes was being removed in the mill with the 13-tonne crane. The cable snapped and the box fell approximately 3 m to the grinding floor. Three previous trips had been made before the incident, and it appears that the rope was damaged on a previous trip. There were no injuries. Proper crane-operating procedures are being reviewed.

On January 20th at a large surface operation, the operator of a .68-tonne truck misjudged the edge of the road due to snow blowing, and slid into a ditch, shearing a wooden power pole. There was no injury to the operator, and only minor damage to the truck. The grader operator, in future, will ensure that a small berm is left to identify the edge of the road.

On January 20th at a large surface operation, a mechanic was jump-starting a grader using booster batteries of a rubber-tired dozer. The mechanic was apparently standing over the battery, the caps of which, when the grader was cranked, loosened and some acid splashed into the mechanic's face. His safety glasses protected his eyes, and only superficial burns to cheeks resulted. The method of hook-up was correct, and it is assumed there was a buildup of ice in the dead battery. All personnel have been warned to stand clear when using booster cables.

On January 20th at an open-pit mine, a fire occurred in the loading station of a tramline. The fire was extinguished in approximately one hour with the aid of the local fire department. There were no injuries. It is believed the fire started in the furnace room of an oil-fired furnace. The furnace was destroyed and extensive damage done to the electrical wiring. The oil-fired furnace will be replaced by radiant heaters.

On January 23rd at an open-pit mining operation, a loaded 90-tonne truck rolled driverless for 135 m down a haulage ramp, and tipped onto its side after striking a protective berm. The operator had stopped the vehicle to extinguish a fire in the rear brake assembly. Release of the rear braking due to fire damage, and a faulty front braking assembly permitted the truck to roll backward uncontrolled down the ramp. Subsequent inspection by the company and a Ministry mechanical inspector determined the cause of the brake failures but doubt remains as to the exact cause of the fire.

On January 29th at a large open-pit mine, an accident which occurred in the product storage area of a molybdenum roaster resulted in serious injuries to a person employed as a helper. Palletized drums of molybdic oxide were being moved by a battery-powered forklift down a 10-m ramp on a 12 per cent grade. The helper was following the unloaded forklift up the ramp when a failure in the electrical circuit of the machine occurred. The machine rolled back down the ramp, and the helper was caught under the forks. The ramp was subsequently posted to bar access to persons while the machine was in use on the ramp, and a flashing light was installed on the unit.

On February 1st at a large underground trackless operation, a two-boom paramatic jumbo starting down a 20 per cent ramp to the working face began to run away. The operator found he had no brake or steering. He also found that putting the drive into neutral or reverse had no effect. He jumped from the machine, and after travelling a total of 24 m the machine struck the wall and stopped. Machine damage was minor. Investigation found that the emergency brake worked poorly. Dynamic braking of the hydrostatic drive worked effectively on the ramp both by stalling the engine and putting the drive into neutral. The steering worked correctly and the hydraulic tank was full. The emergency steering pump motor was burned out and the emergency brake disc and pads were saturated with oil. To prevent this type of incident, the emergency brake was guarded to prevent oil and grease from getting onto the disc. The following recommendations were made: effect a proper operator-testing procedure, report all faults, and if serious, shut down the machine until repaired.

On February 1st at a large underground mine, a cat operator noted smoke coming from the hook of his vehicle when hauling on the night shift. He used a fire extinguisher to extinguish a smoldering wiping rag which had been left on the manifold. No damage was done. There is no knowledge of who left the rag, and the safety suggestion is that more care be taken in the walk-around inspection.

On February 6th at an open-pit coal mine, an apprentice heavy-duty mechanic sustained a finger amputation when he was checking an alternator on a mine truck while its engine was running.

On February 11th at a large underground mine, ice buildup in the backs of the main haulage adit caused some of the water-deflecting structure to collapse, and take the trolley and feeder down with it. A loaded outgoing train ran into the ice, cable and downed structure, and tore out approximately 300 m of the trolley system. There were no injuries. The air heating system is to be checked for efficiency and regular inspections of the adit are to be made and reported on.

On February 14th a diamond drill helper received a broken right arm when he was hit by a vibrating rod while carrying out his duties and instructions as a helper on a wireline diamond drill at an underground copper, lead and zinc mine. The helper was instructed to hold the water hose until the rod, that had just been added, had stopped vibrating. As he took hold of the hose, the rod bent for some unknown reason and, as it came around, struck the helper on the right arm, which resulted in fractures to the radius and ulna bones. In future no one will be allowed in the vicinity of the tail of the rods while the drill is in operation.

On February 14th at an underground coal mine, a small fire occurred in the windings of a 100-horsepower ventilating fan located on surface.

On February 19th at a large open-pit mine, three men were checking the feeder discharge belt for frozen lumps of ore. Two large lumps were deposited on the belt. The emergency pull cord was pulled and the belt stopped. Three men climbed onto the belt and removed the lumps. As the last lump hit the ground the belt started, and one worker was thrown to the east side where he managed to pull the trip wire and stop the belt. The second worker fell onto the belt and rode about 5 m before rolling off. The third worker's right foot went between a roller and the conveyor. It was pointed out that no one was to work on conveyors without lock-outs, and the lock-out to be controlled by the persons doing the work.

On February 20th at an open-pit mine, a loaded 90-tonne Lectra Haul truck rolled on its side while making the turn to dump its load. The dump area, which was being used that shift, had been sanded; however, this truck was travelling too fast to make the turn in the arc of the sanded area. The truck skidded sideways for 30 m then rolled on its side. The driver received a small scratch to one finger.

On February 23rd under excellent weather conditions, an electrician, while proceeding to an assignment, drove his vehicle away from the road over some unbroken snow and off a pit bench rim. In its 12-m fall the vehicle struck the bench face, rolled over and landed on its wheels. The driver was thrown clear, receiving serious multiple injuries to the body. An immediate examination of the vehicle showed that it was in good mechanical condition at the time of the accident. In an interview with the injured man he stated that he had no recollection of the day of the accident.

On February 25th at a large open-pit mine, the brakes failed on an empty 77-tonne Euclid truck while travelling down a haulage ramp. The driver steered the truck into a muck pile and came to a stop. There were no injuries. The oil pan and bottom of the engine block were damaged. The reason for brake failure is being investigated.

On March 30th at an open-pit mine, one truck driver received abrasions and contusions to both legs, and lacerations to the back of the left hand resulting from the 90-tonne Lectra Haul he was driving colliding with another on a 10 per cent ramp. A flash snow storm occurred which made the ramps very slippery. The supervisor was stopping all pit traffic, but this accident happened before he arrived at the 3815 ramp.

On April 3rd at a large surface operation, a worker came in close contact with energized high-voltage collector rings while checking out grease lines in the car body of a large electric shovel. The worker recognized the hazard, and immediately retreated. The close proximity of his hand lantern caused a power outage. The usual lock-out procedure is to disconnect the trailing cable from the shovel entirely, and place a cover plate, lock and tag on the pothead. The worker failed to carry out this procedure.

On April 4th at an open-pit coal mine, a loader operator sustained abrasions to his forearm when his vehicle went over the edge when the bank of a stockpile gave way.

On April 9th in an underground mine, a surveyor suffered temporary unconsciousness after climbing a raise 18 m above the main level. The raise had been blasted on the previous afternoon shift and no ventilation had been supplied to the face.

On April 10th at an underground coal mine, the disc brakes of a supply vehicle overheated and glowed red as the vehicle was being towed out of the mine after running out of fuel. The vehicle's fire-suppression system was quickly operated.

On April 12th at an underground mine, two miners working in a drift heading lit their tape fuse to blast the round, and proceeded out to the main manway, leaving one entrance to the blast unguarded. Two people from maintenance walked by the vicinity of the blast, fortunately, before the shots started to fire. Both miners had their blasting certificates suspended for a period of time.

On April 12th at a large open-pit operation, a 182 Marion shovel required repairs to swing shaft and pinion. Inadvertently the shovel was located on a grade of approximately 8 per cent. The work to be done necessitated removal of the front panels for access to the swing motors. The first swing motor and swing assembly was removed. The job procedure was to complete repairs and re-assemble the unit. Unwittingly and with no thought of the consequences, the second swing motor was removed prior to the completion of the installation of the first swing motor and assembly. Immediately upon removal of the second swing motor, there was nothing to stop the shovel housing from swinging. By good fortune the workers within the housing and others in the vicinity of the shovel were not injured.

On April 12th at an open-pit operation, a Dart 3100 haulage truck experienced brake failure while hauling road-surfacing material down the main pit ramp. The truck went out of control, hit the headwall beside the ramp at an oblique angle, and turned completely over. The cause of the brake failure was due to breakage of mechanical components, and is currently under investigation. The operator received minor injuries which possibly would have been avoided had he been wearing a seat belt.

On April 16th a small fire started in the power house of an open-pit mine. Sparks from a cutting torch ignited the insulation on the wall. The fire was easily extinguished, and there were no injuries.

On April 19th at an open-pit mine, a D-9 Cat overturned when it sank into one of the feeder chutes while pushing muck on the coarse-ore stockpile. The Cat overturned slowly, enabling the operator to brace himself and avoid injury. Damage to the Cat was slight.

On April 20th while spreading waste rock on a road in an open-pit coal mine, the upraised box of a truck severed an overhead powerline. No injuries resulted.

On April 20th at an open-pit coal mine operation, one person sustained head injuries as the result of a blow to the head with an axe handle, during an argument following an incident between two personal vehicles.

On April 25th at an underground mine, the ore train backed into the bucket of a 966 loader while the loader was crossing the track. This part of the track is covered by a snowshed with an opening at the crossover. The procedure for the train and loader to cross this area was not followed. There were no injuries and little damage was done.

On April 28th a heavy duty mechanic at an open-pit coal mine sustained a concussion and abrasions to the chin, when a 9-cm-diameter dragline dump cable sprung back while it was being fed into the wedges.

On April 29th at the site of an underground operation, the operator of a bulldozer backed up, while plowing snow, to a point where the snow gave way under one track, causing the bulldozer to tip over. The operator was protected by ROPS, and escaped uninjured. The equipment was not damaged.

On April 29th a fire started in the concentrator dryer of an underground mine. The fire was detected immediately and put out with extinguishers. There were no personal injuries and no damage done to equipment. The cause of the fire was believed to be heavy oil saturation in the concentrate, the oil coming from a hydraulic leak in the dump cylinder.

On April 9th at an open-pit coal mine, a truck driver sustained multiple injuries when two 182-tonne trucks collided.

On April 30th at an open-pit operation, a loader operator observed explosives being fired under a large boulder while the boulder was sliding down the face from which he was mucking. There were no injuries or damage.

On May 10th a machinist suffered serious injury to his chest and left arm when he was drawn into a 40-cm lathe, which he appeared to have inadvertently started while attempting to take a measurement on a shaft he was cutting down. The machinist was wearing a loose wool sweater and the set screw holding the clamp in the shaft was not the countersunk type.

On May 17th a 90B loader rolled backwards down an embankment at a gravel pit. The incident was caused by the loader's motor stalling when it was backing down an incline. The operator was not able to stop the vehicle with the service brakes, and was not able to reach over to apply the "maxi" brakes. The vehicle received extensive damage but there were no injuries in the accident. The emergency steering was operational but the operator could not engage it in time. Management and operators were instructed to carry out more thorough equipment checks.

On May 19th at a large open-pit operation, the driver of a 91-tonne Lectra Haul noted something different about the vehicle when it suddenly slowed, tipped slightly, and because of load movement, subsequently rolled on its side. The driver did not sustain any injuries. Examination of the vehicle showed that the axle box had split circumferentially and that the left rear dual wheels had broken from the truck. Subsequent examination indicated a previous weld to the support rib had cracked and that several lateral support angles showed fatigue cracks at the wheel motor flanges, and vertically on the sides up to 15 cm.

On May 21st at a large open-pit mine, after waiting approximately five minutes, the operator of a 77-tonne Lectra Haul truck proceeded forward, making a clockwise turn to back through the cable arch. The grader operator (working within the turning circle) saw the truck and managed to back 1 m, but the right rear wheel of the truck hit the left front tire of the grader. There was no damage to the truck, and the grader had broken wheel studs and a flat tire. The truck operator was reprimanded for putting his vehicle in motion without checking to see if the way was clear.

On May 22nd at an open-pit mine, the operator of a 59-tonne Lectra Haul pulled to the right berm to avoid an approaching truck, and was unable to straighten out. The vehicle rolled on to its side, and received little damage.

On May 25th at a large interior underground mine, a miner working in a slusher subdrift had placed a secondary blasting charge in the draw hole, and was in the process of completing the blasting circuit by connecting the leg wires of the E.B. cap to the cabtire blasting cable, when the cap prematurely detonated, slightly injuring the miner about the knees. An investigation was immediately carried out, which proved that a trolley wire at a check-gate of an orepass within close vicinity had energized pipelines, which resulted in the detonation of the blasting cap. To prevent a recurrence of this type of incident, blasting wires shall not be run along pipelines, and strict adherence to the company blasting rules shall be enforced at all times.

On May 27th at a large open-pit operation, a sudden wedge failure occurred partially burying the shovel. This incident occurred in spite of continuous monitoring during cleanup procedure below an area of known slip. The cab of the shovel was damaged, and the operator suffered bruises to his back and legs. The second occupant of the shovel received no injuries. The following recommendations were made:

1. That cleanup in this recognized hazardous area be carried out in daylight hours.
2. That a foreman be in attendance to carry out a constant watch over the area.
3. That accepted job procedure, cab outside and tracks perpendicular to the face, be adopted.

On May 29th at an open-pit operation, the drilling of well No. 16 was completed, and the lining for the hole was being lowered into place when it slipped and fell down the well. The top of the 15-cm-diameter lining was at a depth of 82 m. An adapter, or "fishing tool", was made to attempt to retrieve the casing and save the well. On May 31st, while applying down pressure to thread the "fishing tool" into the casing, the drill rig was lifted off its jacks and before the operator was able to rectify the situation the rig tipped over on its right side. A .9-tonne flat-deck truck was parked 6 m away and was crushed under the mast. The mast was bent and had to be replaced.

On June 3rd at a large open-pit mine, a sinking out was blasted in which a piece of rock 20 cm by 25 cm square was hurled 600 m horizontally and 20 m vertically, smashing in the door of an unoccupied pickup truck. It was concluded that, because of the unusual drill pattern and broken material, a loose rock was "cannoned" an unusual distance. It was recommended that sinking patterns not be developed in areas of loose rock or where drill patterns are changed by being forced into unusual patterns.

On June 5th at a large open-pit mine, a Terex truck was in the process of dumping when another Terex truck backed up to dump, and hit the first one. There were no injuries, and approximately $1,000.00 damage was done. The driver was reprimanded.

On June 5th at a small underground mine, a mine locomotive and three 3-cubic-meter granby-type cars fell from the trestle and slid down the waste dump to the road 10 m below. There were no dump wheels on the cars and as the first car was being dumped by a pneumatic cylinder mounted on a parallel track the safety chain broke, the car overbalanced and pulled the loci and two full cars over with it. Proper dump wheels and ramp are to be installed as soon as possible. Heavier safety chains will be used and the travel of the dump cylinder limited until proper dumping can be done.

On June 8th during barge-loading operations at a limestone quarry, a worker stepped out of the electrical control room to talk to another worker and fell 3 m through an opening to the platform below, receiving cuts to two fingers and scrapes to his left arm and right leg. Apparently the contractor had failed to secure the walkway planks when building the dock. At the time of investigation the planks were secure.

On June 12th a Northwest Log Stacker, which had been converted to a dragline for loosening sand and gravel from high pit walls, toppled over at pit rim at a large gravel pit operation. The operator of the machine claimed that a total loss of braking had occurred while he was manoeuvering the machine into its working position, and his problems were further complicated when the right-hand drive chain fractured. The total braking system on the machine, which was of the fail-safe type with multi-disc actuation, was thoroughly checked after the incident, and no reason could be determined as to why the brakes should have failed. There were no personal injuries but the machine was extensively damaged and may not be repairable.

On June 18th at a large surface operation, a loaded M-100 Lectra Haul was driven into a rock wall while ascending a ramp between the pit and dump. The accident caused considerable damage to the steering mechanism, left front wheel and cab deck of the truck, and has been attributed to driver error due to fatigue, drowsiness and loss of awareness. The operator suffered some shoulder injury during a last-minute effort to avoid the accident.

On June 23rd, an exploration driller sustained first- and second-degree burns to his arms when gasoline, which he was using to clean the drill rig, was ignited by a spark from a poorly insulated electrical connection.

On June 25th at a limestone quarry, while drilling blast holes, a 15-m bullhose burst from the air pressure being supplied from a portable compressor. Two 15-m hoses were being used in tandem from the compressor to the drill, one hose being made of wire-reinforced braided material, and the other not reinforced. Investigation revealed that the bullhose that burst should not have been in use because of its deteriorated condition. There were no injuries.

On June 27th at an open-pit coal mine, the driver of an M-100 haulage truck sustained a broken nose, abrasions to the back and shoulder, and a large cut to the head when a coal stockpile gave way under the rear wheel of his vehicle. The truck went over backwards coming to rest upside down on its box on the ground 6.60 m below. It would appear that, some time earlier, coal had been removed from the toe of the stockpile leaving a vertical face of unconsolidated, and therefore structurally weak material. It is considered by the Inspector that the danger of a vertical face in unconsolidated material should have been predicted by the supervisor carrying out the dump inspections.

On June 28th at a large open-pit mine, the right rear wheels of an M-85 Lectra Haul caught the cement abutment when leaving the crusher dump. The inertia of the truck lifted its front end, causing it to swing to the right, which resulted in the vehicle straddling the abutment. The hydraulic and exhaust systems were severely damaged. The cause of the accident was found to be operator negligence, and the operator was severely reprimanded and discharged.

On June 28th at a limestone quarry, an 8-cm bullhose broke loose from a coupling of an air-track drill while the driller was drilling blastholes. The safety chain prevented the hose from whipping around, but there was enough slack in the safety chain to allow the hose to whip, and strike the driller, causing bruises to his leg.

On June 28th at a large open-pit operation, a 182 Marion shovel, during a move, struck a powerline, blowing a power cable and a diode on the shovel. There were no injuries. The move was supervised, indicating inattention on the part of the supervisor and shovel operator. Recommendation was that job procedure, and the hazards of live powerlines and cables be further brought to the attention of supervisors and employees in a concentrated safety program.

On June 29th at a large open-pit operation, a 769 Cat truck was parked in front of the tire bay for a tire change. The column brake and the park brake on the transmission console had been set prior to shutdown by the driver. In the meantime an electrician had repaired a faulty tail-light, but did not touch any of the controls. Inadvertently this truck moved backwards some 20 m before stopping. Investigation revealed that the transmission park brake was in neutral, the hand brake was on, and the air had drained off. A small leak was discovered, but there was no apparent reason for the transmission park brake to disengage. All vehicles are equiped with chocks, and it is recommended procedure that chocks be used.

On July 3rd at a large underground mine an electrical fire occurred on a switch panel in a subdrift which supplied five slushers and two ventilation fans with power. The incident was thought sufficient to instigate the use of stench warning, and to alert mine-rescue teams. It took less than one hour for all personnel to be safe in refuge stations, and the disaster programme to be in full swing. Electricians cut off the power at the substation and fire-fighting crews extinguished the fire with dry chemicals, and subsequently with water. The fire was thought to have started by a loose, overheated terminal. To prevent a recurrence, annual preventative maintenance of 600-volt installations will be started in which an infrared scanner will pinpoint hot spots before they become dangerous.

On July 4th at an open-pit operation, a drill helper dropped either a burning match or a burning piece of paper from the window of the cab of a drill. The paper lit the protective cord on the prima cord of a drill hole. The prima cord was extinguished with a dry chemical extinguisher, and a short piece of the perma cord was then cut off.

On July 9th at a large open-pit mine a water truck, under the guidance of the shiftboss, was driven under the main 25,000-volt transmission lines. The truck cleared the first two lines by 0.3 m, and made contact with the third line. The truck stopped, and under the shifter's instructions, backed clear of the lines. In future, all visual checks are to be made in daylight, and a minimum of 0.2 m be kept between the overhead transmission lines, and any equipment below it.

On July 11th at an open-pit operation, a truck, which was being driven along the outside of a straight stretch of uphill gravel road, was caught in a windrow of sandy material. Attempts to steer the vehicle out were apparently futile, and the vehicle finally left the road, and slid down the embankment approximately 4 m. There were no injuries.

On July 12th at a large open-pit mine, a dump, which was on relatively soft ground, was inspected at 5 p.m., and placed on active status. Due to the nature of the ground, the truck drivers were instructed to dump short, and the dump man was instructed to put rock fill over the dump. At 7.45 p.m. the shifter again inspected the dump, and found the situation satisfactory. As the D-8 was required at the shovel during lunch break there was to be no dumping until it returned. One driver arrived at 8 p.m. so he parked approximately 15 m from the berm. At 8.30 p.m. on the arrival of the dump man, the driver attempted to move to the dumping point, however, the rear wheels had sunk and he could not move. The driver of the D-8 moved behind the truck, and felt the dump move. He drove the D-8 clear, and advised the truck driver to abandon his vehicle. Subsequently the dump sloughed, dropping approximately 4 m, and the truck came to rest on its wheels at an angle of approximately 75 degrees. Sloughing was due to a rapid advance over a narrow front. This did not allow the dumped material to displace the tailings.

On July 14th at a large open-pit mine, the operator of a Lectra Haul truck had dumped his last load, and stopped on the safety berm. He placed the hoist control in lower position, felt the thump of the first stage retracting, released the control lever, and felt one more thump. Believing the dump box was down, he proceeded to the pit truck park, passed under a shovel trailing cable on a pole arch, and under the pit powerlines to the mine dry. The dump box caught the next set of lines, tore down the lines, and broke three poles. The operator apparently remained unaware of this, and it was not until he reached the next set of lines, where only one phase was torn down, that he stopped the truck. He remained in the truck until the power had been locked out. On investigation it was found that: (1) the hoist control lever was in the "hold" instead of the "float" position; (2) the hoist control lever had a spring return to prevent accidental operation, and this spring return was strong enough to take the control lever past "float" into "hold" position if released too quickly; (3) when in "hold" position the dump box will not lower, but can be raised by means of externally applied pressure. The following recommendations were made:

1. Dump box position indicators be in place at all times.
2. Replace hoist control with new model eliminating the spring return, or remove the spring, and maintain control system on manual operation only.
3. Where practicable, ensure adequate clearance under future powerline installations to allow haulage trucks to pass under with dump box fully raised.

On July 16th at the construction site of a mining project, the operator of a loaded gravel truck encountered another vehicle coming toward him. He moved his truck well over to his side of the road in passing, when his right front wheel ran onto a soft shoulder causing the vehicle to go out of control, finally going off the road and into a slough, where it rolled onto its side. The operator escaped with bruises.

On July 18th at an underground operation, a Massey-Ferguson tractor backhoe rolled on its side while attempting to climb a steep grade. There were no injuries, and little damage. The operator was using his seat belt.

On July 22nd at a large surface operation, the operator of a water truck felt a sharp pain in his chest at the same instant his vehicle hit a bump, when he was turning his vehicle onto a side road. The vehicle went out of control, and rolled onto its side in a ditch. The operator was not injured, but was taken to a nearby medical clinic for examination. He was later released and returned to complete his shift.

On July 26th at a large open-pit mine, a dangerous occurrence took place when a conveyor system was improperly locked out by surveyors working on an ore surge pile. The system was started while the surveyors were still doing a volumetric calculation after a lock was removed forcibly on instruction from the mill General Foreman. No injuries were sustained in this incident but proper lock-out procedures were reviewed, and will be carried out at all times in the future.

On July 31st at a large open-pit mine, a loaded ore truck was travelling up the haulage way in second gear when it powered out, and the operator shifted down to first gear. While shifting, the truck slipped back against the berm, and went over on its left side. The road was slippery, due to rain. There were no injuries. Increased training, and better road maintenance have been recommended.

On August 8th at an open-pit operation, two mill mechanics were conducting service checks on the pumps located below the flotation floor in the molybdenum plant. While checking a sump pump the sump went dry, followed immediately by a strong odor, and the two employees were rendered unconscious. Hydrogen sulphide was suspected although subsequent testing revealed "no trace" of hydrogen sulphide or hydrogen cyanide.

On August 8th at an underground mine, a stope which day-lighted on the 3500 level was being back-filled from the surface with an ST-2B scooptram. Due to darkness, the operator misjudged the edge of the dump as he was pushing the fill into the stope, and the scooptram slid for about 7 m on the sloped fill until it came to rest at the floor of the stope. The equipment travelled down slope with the bucket on the fill, and there were no personal injuries or damage to the equipment. Better lighting was recommended for this type of work.

On August 14th at a large open-pit mine, a D-8 bulldozer was upset off a flat-deck, low-bed haul unit. The operator was attempting to unload the D-8 dozer from the flat-deck when it rolled off the unit, and came to rest on its right side. The operator was wearing a seat belt at the time the incident occurred, and no injury was sustained. There was no damage to the bulldozer or flat-deck unit. It was recommended that a second person be available to direct the operator's line of retreat in such operations.

On August 14th at a large open-pit operation, a Yale forklift was upset on a 7-degree decline as it went out of control due to excessive speed and rough road. The operator was not injured as he managed to grab and hold onto the upper structure of the roll-over canopy. He was not wearing a seatbelt as none was available on the machine. The damage to the forklift was minimal.

On August 14th while doing construction work in a concentrator building, a mechanical crew was involved in burning some material while doing demolition work inside the building. A fire resulted which activated the sprinklers, but the blaze was quickly extinguished by the fire pickets. It was recommended that, during burning, fire extinguishers should be kept nearby.

On August 16th at a large open-pit copper mine, a dangerous incident took place when a person who was assigned to work on the tripper gallery of the conveying system had his hand injured slightly when it was caught by a return idler roller. Upon the arrival of the foreman, it was found that the worker was impaired by either alcohol or drugs. The worker was taken to the first-aid station, attended to, and then sent home. The next day the worker was discharged for being unfit to carry out his assignments in a safe and efficient manner.

On August 17th at a large open-pit copper mine, a dozer operator backed a D-8 Cat into a draw hole of a large surge pile below a tripper gallery. The cause of the incident was due to poor visibility as the windows of the cab of the dozer were extremely dirty. It was recommended that operators of such equipment have good visibility at all times, and that checks be made by the supervisor at frequent intervals to ensure that this be done.

On August 20th at an underground mine, the shiftboss found a miner in a development heading, drilling a bootleg. The company suspended the miner from blasting and reported to the Inspector. After investigation by the Inspector, the miner's blasting certificate was suspended for two weeks.

On August 21st at an open-pit coal mine, a machinist in the wash plant sustained a strain to the right elbow when the improperly locked-out man-lift was restarted.

On August 22nd at an open-pit coal mine operation, the driver of a haulage truck sustained a minor scalp laceration and a bruised arm when his truck tipped sideways into the ditch after making contact with the edge of the road.

On August 23rd at an open-pit copper-molybdenum operation, a production haul truck operator fell asleep, and drove the 108-tonne vehicle off a haul road. The loaded unit came to rest upside down after dropping 3 m to the bench below. The driver received abrasions to his left forearm. The damage to the vehicle had not been estimated at the time of the investigation.

On August 30th at an underground copper mining operation an ST5 scooptram went out of control while climbing an access ramp. The machine travelled approximately 80 m down the ramp before coming to a stop against the wall. Minor injuries were sustained by the operator, and the scooptram was moderately damaged. Subsequent investigation and tests did not reveal a mechanical fault which would cause the runaway, and operator error is probable.

On September 5th at a large open-pit operation, a large container was being loaded on a truck with an overhead crane. As the container was being lowered, the dead end of the hoist cable pulled out of the socket, and the container fell approximately 30 cm. There were no personal injuries, and no damage to equipment. After investigation by the engineering department and the supplier, it was decided to change the fastening arrangement of the dead-end cable. The crane has now been tested, and put back into service.

On September 8th at a large open-pit mine, workmen prepared to lift the feed chute and structural assembly from the crusher. On taking up the weight one of the lugs tore out. The workers then re-attached the sling to a third lifting lug. When the assembly was clear of the crusher the second lug tore free, and the assembly fell 5 to 6 m to the floor. On examining the two lifting lugs which broke out, it was found that the chute wall broke around the perimeter of the welds. This is apparently the result of crystallization of the steel from the heat of welding. It was also found that the chute was constructed of CHT-500 steel which would be more susceptible to crystallization under these circumstances than mild steel plate. The following recommendations were made:

1. In future, fabrication of similar structures be of mild steel where possible.
2. Lifting lugs be welded to backing plates, which in turn would be welded to the structure, thereby spreading the stress over a greater area.
3. A minimum of two slings be used when lifting this, and all similar structures.

On September 13th at a coal-mine operation, one of four guywires supporting a 10-tonne concrete power pole parted, and allowed the pole to topple and fall to the ground striking the outrigger and door of a backhoe. The pole was being erected with its base in a 3.6 by 3.6 by 3.6-metre excavation which had not yet been backfilled. The crane, which had been used to put the pole into position, had been removed and the guywires were being used to pull the pole into a vertical position prior to backfilling. Investigation by the Company suggested the need to keep the crane in position until the base of the pole has been backfilled into position.

On September 15th at an underground operation, a sequence of four rings were blasted to produce 32,000 tonnes of ore. Subsequent inspection showed that an additional six rings had fallen to produce an estimated 23,000 tonnes. The mine had been employing an open-stope and pillar type of mining operation using fringe drifts to drill and blast successive rings into the opening created by the undercut and the slot. The rock formations were very competent. The stope is under investigation following this incident.

On September 16th at an open-pit operation, in the course of making a pass close to the edge of a pit road, the blade of a bulldozer caught on a boulder, causing the rear end of the machine to slip off without overturning. The operator turned the machine into the fall line, and attempted to stop it by dropping the blade. The bulldozer continued to slide down the angle of repose in the slope material, and finally stopped on a berm approximately 54 m below. The operator then attempted to walk the bulldozer out, but after it began to slide again, he left his machine, and informed the foreman.

On September 18th at an open-pit copper-molybdenum mine, a 154-tonne production haul unit loaded with waste, was driven into a 1-m drainage ditch while ascending a ramp. The driver, who was on a prescribed medication, fell asleep at the controls, thus causing this dangerous incident. No injuries were received, and no damage was done to the haul unit. It was recommended that all persons who are on medication report their condition to their supervisors before commencing their shift.

On September 25th at a large open-pit mine, the driver of a haulage truck backed to the berm where the D-8 Cat operator was spotting the truck. The truck operator lost sight of the spotter and, instead of stopping, he continued backing. The cat operator signalled for him to stop, but was ignored. The rear right wheels went over the bank, and the truck rolled on its side. There were no injuries to the driver and trainee, and damage to the truck was minor. The operator was reprimanded with a one-day suspension for negligence, and it was recommended that he not be used as a trainer.

On September 26th at a large open-pit operation, a 154-tonne Euclid haul unit went into a skid, and rolled off a haulage ramp. The vehicle fell approximately 13 m to the bench below, coming to rest upside down. The operator received abrasions to his right leg, and some small cuts to his face, plus a possible slight concussion. He was wearing a seat belt at the time of the incident. Damage to the unit was extensive but had not been estimated at the time of the investigation.

On September 26th at a large open-pit mine, a 109-tonne production haul unit was backed over a waste dump and came to rest submerged in approximately 10 m of water. The driver was able to get clear of the unit as it entered the water, and swam to shore, where he was helped to safety by a dozer operator who was close by. The operator was suspected of being impaired, and after the R.C.M.P. were called, and a breathalizer reading was obtained, this was confirmed by the Constable attending. It was recommended to management that more stringent procedures of checking employees going on shift be implemented immediately, and adhered to at all times. The operator was not injured but the haul unit was likely to be a write-off due to an impaired operator being allowed to operate mobile equipment.

On September 27th at an open-pit coal mine operation, a passenger in a fuel truck sustained a bruised knee when the truck was struck by a compressor, which was torn loose, when a nearby drill rig tipped over onto its side.

On September 29th at an open-pit mine, a smoldering fire was noticed in the carpenter shop. Investigation revealed that sawdust, which was covering a steam hot-water pipe, had caught fire from sparks being discharged from a grinder situated 1 m from the pipe and sawdust. The grinder has been moved and all pipes in the carpenter shop vacuumed.

On September 30th at an underground operation, a contracting company was replacing the roof on the mill. At the end of the shift, a journeyman sheet metal mechanic attempted to slide down 21 m of power cable to the the deck below. The worker froze after 4.5 m of descent, then lost his grip, and fell 13.5 m to the deck below. The worker suffered broken ankles, broken pelvis, and impacted vertebrae. Ladders are provided for access to the roof. Prompt action by the first-aid man in summoning immediate helicopter transport undoubtedly saved the worker's life.

On October 1st a slide of approximately 909 tonnes buried the shovel bucket and the front part of the shovel to about 3 metres above the ground. The shovel had been working in a questionable area after dark. The clean-up was completed during daylight hours.

On October 1st at an open-pit operation, a service truck went out of control while travelling downhill on the mine access road. The vehicle skidded into the right ditch and overturned. The occupants received minor, but no lost-time injuries. A mechanical inspection carried out on the vehicle showed the brakes to be operational, but that the front wheel brake adjusters had unequal movement, which may have caused the truck to pull right when the brake was applied. An inspection of the steering box showed several gear teeth had been broken off in the accident. The truck was found to be in fourth gear during the inspection. Excess speed was believed to be a contributing factor.

On October 9th a hunter discharged a firearm inside a "no-shooting" zone at an open-pit coal-mine operation. The information concerning the incident has been turned over to the Fish and Wildlife Branch for further investigation and any necessary action.

On October 9th at a large open-pit mine three welders were removing a 5.5-metre by 6.1-metre bay door at the maintenance shop. To control the fall, two cables from the top and bottom of the door were anchored to pickup trucks. When the door fell, the small man door contained in it opened, hit the ground, and caused the bay door to kick back, pinning a welder's leg to the bumper of the pickup. The welder's leg was badly bruised.

On October 9th, a service vehicle (.68-tonne pickup truck) had the driver's door damaged by a 6.4-metre front-end loader. The service vehicle went too close to the loader without having the attention of the loader operator.

On October 11th at an open-pit mine, a 91-tonne haulage truck ran off the haulage road and rolled onto its top down a 10-metre embankment. The operator was assisted out of the cab through the door window by another truck driver. The operator was apparently uninjured but was removed to hospital for observation. The roadway was straight and level, the weather clear and visibility good. Since he had just met another haulage truck it would appear the operator just pulled over too far, got caught on the shoulder, and went over. There was no safety berm on the road.

On October 12th at a large open-pit mine, a concentrate truck was proceeding from the mine to the ferry landing, when it went out of control on a curve, due to mud conditions and the crown of the road. The truck slid to the shoulder and rolled over. There were no injuries. It was recommended that the road be banked and kept surfaced with gravel.

On October 13th at a large mining operation, the main hook from a 32-tonne Demag overhead crane fell about 7 metres to the floor. Investigation revealed that the cable came off the equalizer sheave. Guards have been placed over the cables on the equalizer sheaves on all similar cranes on the property to prevent any recurrence.

On October 14th at an open-pit coal mine operation, a water boy ran out of control and veered off into the ditch of a haul road when the brakes failed.

On October 17th in a concrete plant at a mining project, a young apprentice was cleaning the rollers on the conveyor while it was in motion, when his left hand was caught between the rollers and the idler sheave. Some time evolved before the worker's hand could be freed, and it was severely injured. To prevent a recurrence of this incident the lock-out switch procedure will be rigidly enforced, and belts kept idle during maintenance. Proper instructions to apprentices are also required.

On October 20th at a large open-pit mine, a loaded haul truck pulled away from the shovel and proceeded to the ramp (distance of 242 metres), striking a steel pole used to support trailing cables across the ramp. Damage to the air cleaner was $2,000.00. The operator admitted to falling asleep. He also had previous safety rule violations. His position was terminated.

On October 25th at a large underground trackless operation, a Wagner UT45A lube truck developed a fire behind the driver's seat. The operator stopped the vehicle immediately, radioed for help, and emptied a 0.9-kilogram fire extinguisher on the burning area. With the aid of several handfuls of sand the fire was extinguished. The fire was started at the manifold where a smouldering wiping cloth was found. Machine damage was minor. To prevent this type of incident it was recommended that the manifold be wrapped with insulation material, an ansul nozzle and larger extinguisher be added to the fire suppression system, a rag box be installed, the machine to be steam cleaned after any spills occur, and a refresher course on fire extinguisher use be given to operating personnel.

On October 28th at an open-pit mine, a loaded coal truck went into overspeed and crashed into an "island" of rocks. The driver, who sustained no injuries, claimed that the brakes would not hold. Inquiries made of the previous driver would suggest that both the dynamics and the service brakes were weak but that this had not been reported or recorded in the vehicle log book.

On October 29th, a 23-tonne truck jumped out of gear while descending a grade on an access road of a coal exploration property. The driver, feeling that the brakes would not hold the vehicle on the steep grade, bailed out. No injuries were sustained.

On October 30th at an open-pit coal mine, the driver of a haulage truck sustained bruises when his vehicle drove off the road as he was backing up a ramp which was under construction. The operator sustained bruises to his left leg and forearm.

On October 31st at an underground coal mine, a 911 LHD Unit ran backwards out of control when the operator failed to utilize the vehicle's brakes. No injuries were sustained when the vehicle was steered into the rib.

On November 1st the operator of No. 53202 pickup truck was enroute from the pit to the mechanical shop travelling on the main haulage road. As he approached the primary crusher ramp he saw the mine shiftboss parked at the left shoulder of the road, approximately 18 metres to the pit side of the ramp entrance. He passed the pickup and at this time saw M-85 No. 1640 leaving the ramp. He applied his brakes, but the pickup continued on a collision course towards the M-85, so he opened the door and threw himself clear. At approximately the same time the operator of the M-85 saw a "flash" of light and applied the service brakes. The front end of the No. 53202 struck directly into the face of the right front tire of No. 1640. It was recommended that traffic control regulations be strictly enforced, maintenance and use of vehicle warning equipment (Buggy Whips and Amber Flashers) be enforced, and all non-essential traffic be kept off the main haulage road in the vicinity of the primary crusher ramp.

On November 2nd just prior to the re-blast of a misfired hole at an open-pit coal mine, two blast-zone guards left their post permitting a bus carrying the oncoming crew to enter the danger area. Fortunately the bus was spotted by a pit supervisor and the blast was held until the area had again been made secure. When the blast was finally initiated, it was reported that a shovel located outside the blast area was struck by flyrock. No injuries were sustained by the two men who were in the shovel at the time. The Inspector's investigation suggested that the line-ups given to the guards were somewhat less than adequate and that confusion arose with regard to communications during preparation for the blast and in the identification of the guards. Recommendations have been made by the Inspector with respect to improving the identification, training and line-up for blast-zone guards together with a recommendation to eliminate blasting one-half hour each side of a shift change.

On November 2nd at a large open-pit copper operation an R-170 Euclid haul unit went over an embankment approximately 4 metres in height, and came to rest with its left front wheel in a drainage ditch. The cause of this incident was due to the operator falling asleep. There was no injury to the driver and damage to the unit was minimal. It was checked out mechanically and was back in operation within 24 hours.

On November 5th at an open-pit mine, a pit blast threw small rocks some 300 metres, punching a hole in a conveyor gallery leading from the crushing plant. The rock also caused a leak in the propane line in the gallery. The propane line was turned off immediately by a worker who heard the noise from the blasting station. No injuries resulted as all personnel were safely located in recognized blasting stations.

On November 5th at an underground coal operation, a diesel-powered supply vehicle skidded off a snow-covered road and down the mountainside. There were no injuries involved in the incident.

On November 6th the engine compartment of a D-8 Caterpillar was filled with muck while the operator was pushing at the side of a muck pile, approximately 2.4 metres high. There was slight damage to the engine hood and battery box. There were no personal injuries.

On November 7th at an open-pit mine, an electrician suffered electrical shock along with bruises and lacerations to his body. The electrician was working up a pole, placing a secondary line about 1.8 metres below a live 25,000-volt line. It is uncertain as to whether he came in contact with the primary line or just got close to it; however, the shock caused him to slide down the pole to the ground. In future, this type of work will be done from the line truck with an insulated fibreglass bucket.

On November 8th at an underground mine, an unexpected detonation occurred while the operator was mucking out a re-blast trackless heading with a 988B Caterpillar loader. This round had previously been loaded and blasted electrically together with a slash, then re-blasted two times subsequently. Extensive front-end damage was done to the loader. The operator sustained a small cut on his knee. The incident is being investigated; however, it has been suspected that a faulty blasting machine may be responsible. The miner operating the loader was a capable miner who had over 10 years of drift development experience.

On November 9th on the surface of a new mine where major construction work was in progress, an ironworker was struck by the boom of a 25-tonne-capacity mobile crane which toppled over when the crane was unbalanced. He received serious injuries to both legs, one leg was subsequently amputated below the knee. The crane was being operated in an unstable condition for the loads being lifted. The area on which the crane was standing was not wide enough to permit the stabilizers to be fully extended and hence resulted in crane instability.

On November 10th at a large open-pit mine, a backhoe operator was running over mounds of gravel in an area he was not working. He upset the 930 Caterpillar loader. There were no personal injuries and very little equipment damage. The man was dismissed.

On November 12th at a large open-pit coal mine operation, a heavy-duty mechanic sustained first- and second-degree burns during an explosion which occurred while he was attempting to start a cold engine of a haulage truck. It would appear that he had made use of starting fluid (ether) and then commenced use of a propane torch.

On November 13th at the surface of an underground coal mine operation, an employee sustained a fractured right arm when he was pulled into an unguarded nip-point between a conveyor belt and its head pulley.

On November 19th in the main crosscut, 900-metre level of an underground mine, mucking and scaling of a round had been completed and drilling commenced, when loose ground fell on one of two miners at the face, resulting in a severe fracture of the left leg. Examination of the work area revealed flat-dipping fractures in the ground, which would require rockbolting. No rockbolting had been done prior to the fall of ground.

On November 21st at an open-pit operation, an employee of the mine operating department sustained multiple contusions and strains when the haulage unit he was operating dropped over the edge of the stockpile, slipped approximately 15 metres, and came to rest on the left side. The employee was subsequently removed from the vehicle, walked to the ambulance and transported to hospital.

On November 21st at an open-pit coal mine, a dump supervisor narrowly missed serious injury when he crossed in front of an M-200 haulage truck which was making a turn in preparation for dumping. The dump supervisor was forced to dive between the front wheels of the vehicle as it unexpectedly moved forward.

On November 21st at an open-pit mine, a 90-tonne truck inadvertently backed through the berm and toppled some 66 metres down the face of the dump. The truck, which also caught fire after a fuel-tank explosion, was completely demolished. The driver, who was either thrown out or jumped out, was found 30 metres down the face of the dump with a fractured skull. An accident of this type indicates the need for surface mine-rescue training.

On November 22nd during shift change at an open-pit mine, the crew bus was parked on the down ramp with the park brake on, transmission in first gear and engine off. The replacement driver depressed the clutch and placed the transmission in neutral preparatory to starting the engine. The bus rolled down-grade backwards, sideswiped a truck and was stopped against a wall. The new driver claimed there was no service brake available and he could not get the vehicle in gear. There were no passengers aboard and damage was minor. A check of the brakes found them to be in order; however, no wheel chocks were used and no flat spot had been selected for parking. A review of all bus drivers and operating procedures was recommended.

On November 24th two employees at an open-pit coal mine operation were found to have liquor in their possession. As this was determined to be in contravention of the mine's own policy and the *Coal Mine Regulation Act*, the two employees were discharged.

On November 28th at a large underground trackless operation, a Wagner UT45A lube truck caught fire in the engine compartment. At the time, the machine was parked and the operator was about 20 metres from the unit. The fire-suppression unit was activated and the fire was extinguished. A wiping rag was found lying on the exhaust manifold. This was the second fire to occur on this unit in 34 days from the same cause. There was no damage to the machine. Recommendations from the first incident had been carried out except that the rag box was not always used, the manifold was not protected, and the machine was not clean. To prevent a recurrence of this incident a thorough walk-around inspection is to be made at the beginning of each shift, rags are to be stored in the provided metal container and emptied out at the end of shift, housekeeping on the unit is to be upgraded, and supervisor inspection is to be carried out regularly.

On November 29th a pickup truck was hit with a small piece of rock and caused some damage to the passenger's side of the cab. A Caterpillar was working on the catchment above. All equipment was removed from below but the roadway was not barricaded off, thus the pickup drove in.

On November 30th a millwright making a check on a conveyor belt manlift in an open-pit mill noticed severe slashes in the belt. Investigation indicated the slashes to have been done intentionally.

On December 3rd on a mining access road a 12-E Grader overturned while pushing back the bank from the previous night. The left front wheel dropped into a washout which pulled the whole machine over the bank. The machine slid down a short distance and rolled, finally coming to rest on its roof. The operator was uninjured and the grader had minor damage done to the cab and windows. The accident was caused by operator inexperience, snow conditions (white outs) and the use of the incorrect machine.

On December 3rd while hauling at a large open-pit, the right front suspension separated from the frame of a Wabco 120B Haulpak truck. The truck settled on the road and no one was injured, but the truck suffered other undercarriage damage. Examination showed that the suspension mounting bolts had failed by stripping and/or breaking. A closer inspection of these bolts might have prevented the accident.

On December 5th at an underground coal mine a small fire (coal fines) occurred when a defective brake caliper on a shuttle car overheated. The fire was quickly extinguished.

On December 6th in an underground mine, a crew was involved in rockbolting a brow of a drawpoint in a remote section of the mine, when a blast set off in the main mine section triggered movement of muck at the drawpoint. No one was injured and no damage was done.

On December 11th at a large open-pit operation, a Bucyrus-Erie 45-R rotary drill broke away as it was being pulled upgrade by a Dart D600 loader, and rolled backward about 25 metres and finally stopped on a level section of road. Examination showed that the tow bar hitch on the drill had broken, followed by the breaking of the safety cable shackles. The company has taken steps to improve the hitch and towing arrangement. No one was injured or equipment damaged as a result of the mishap.

On December 11th at an underground mining operation, a loaded ore train pulled by an electric trolley locomotive collided with a steel ventilation door. The locomotive operator was uninjured, having left the loci cab prior to collision. Subsequent investigation revealed that the probable cause of the incident was accidental vent-door operation and excessive train speed.

On December 13th while removing the discharge bearing cap from an autogenous grinding mill, a worker fell between a work platform and the mill, landing on a concrete floor approximately 7 metres below. The worker suffered slight concussion, a fractured pelvis, and minor rib injuries. Inadequate supervision, unsatisfactory work habits, and failure to use safety belts were contributing causes.

On December 16th, the operator of a cable reeler began to descend the ramp of an open-pit mine with the machine in high gear of the high range. It is stated that the operator had 2½ months' experience operating that particular machine and was aware that the machine should have been in the low range. The engine could not hold the machine to a reasonable speed, consequently the brake pads heated up and burned off. The operator jumped off and sustained a major flesh wound to the inside of his thigh. The machine went over the side of the ramp but remained upright and stopped on the next bench.

On December 19th at a small interior underground operation, a miner drilled into a bootleg which exploded causing injury to his partner. Inspection showed the face had not been properly examined or washed down, bootlegs had not been properly washed out, and primers used in the previously blasted round had not been properly made up. The miner's blasting certificate was subsequently suspended for a three-month period. In order to prevent this type of incident recurring, instructions to supervision have been given by the Inspector to ensure that Rule No. 80 of the *Mine Regulation Act* is followed and the proper make-up procedure for primers is used.

On December 19th while a loader was occupied in moving iron pellets from the stockpile in the pellet shed, a slough of ore occurred from the pile covering an area of 18 metres by 18 metres by 3 metres. The loader was clear of the pile at the time.

On December 20th at an underground operation, a crew of blasters were loading rings adjacent to a slot raise, and had completed loading the fourth ring a distance of 4.8 metres from the slot, when muck dislodged from the slot, attendant and coincident with the blasting of a development round in another part of the mine. There were no injuries.

On December 22nd a snowslide swept over the portal area of an underground mine. Heavy snowfall had ensued for the previous 24 hours and conditions were known to be hazardous. A bulldozer operator and a bombardier operator were in the area at the time, and the bombardier was moving to a location to set a charge to blast the snowslide area. The slide engulfed the bombardier and swept the compressors and the shed at the portal. The operation had been closed for the season and avalanche recommendations had been instituted by a consultant.

On December 23rd at a large open-pit mine, an M-85 Unit Rig arrived at the stockpile, backed up to the berm and set the dump brake. At this point the dump broke away and the truck went down the face backwards. When it reached the loads at the toe it tipped to the left and lay on its left side. It is recommended not to dump within 5 metres of the edge of a stockpile. Also where a shovel or loader is loading from a stockpile the operator should report the condition of the face on leaving.

On December 28th at a large interior operation, dense smoke was encountered on a shaft-level station by the skiptender on his first hoisting run of the shift. All sections of the mine were notified as well as the Mine Inspector, and emergency procedures were initiated. The mine foreman, with a rescue team in all-purpose masks, immediately investigated the station area and found the pipefitter's tool crib on fire. They immediately extinguished the blaze with a fire hose. Investigation showed that the fire probably started from an electrical short in a cable feeding a portable heater within the tool room. It was also found that the room was not clean, with rags, etc., in the area where the short circuit occurred. To prevent this type of occurrence in future it is recommended that, if heat is required in the tool room, the room must be made fireproof and kept clean.

On December 29th at an underground coal mine operation, a diesel-powered supply unit went off the side of a surface road as it was being pushed to the garage. No injuries were sustained.

On December 31st at a large interior underground operation, a welder was cutting 1.90-centimetre nuts from a 6-tonne mine car on the concrete floor under a crane in the shaft station. The welder ran out of oxygen, shut the job down and proceeded to do other work away from the area. Two mechanics in control of the skip in passing the station noticed hot sparks coming down through the hanging wall lagging of the shaft some four sets below the station where the bolt cutting had taken place. The fire was then extinguished with a dry chemical extinguisher, the hanging wall lagging removed and the area soaked with water. A 1.9-centimetre nut was found imbedded in the timber lagging. Apparently, a red-hot nut had fallen through a 3.3-centimetre drain hole on the station floor, rolled down the hanging wall lagging of the inclined shaft and came to rest four sets below the station. To prevent this type of incident in future, station drains are to be plugged or enlarged and screened. Wherever possible work within 7 metres of shaft doors is to be discouraged.

Dangerous Occurrences, 1980

In January and February, during installation and testing of several transformers at a base metal mine under development, the contractors suspected abnormalities as a result of the dialectric tests. Subsequent chemical tests revealed the presence of P.C.B. The companies informed Pollution Control Agencies and the matters were attended to in a routine manner.

On January 6 at an underground mine, the ninth car of a twelve-car ore train derailed. The derailed car knocked out two posts in a timbered section causing the caps to bring down the trolley line. The probable cause of the derailment was poor car maintenance along with too-fast braking. There were no injuries.

On January 7 at a limestone quarry, a haul truck skidded on a main access ramp due to wet snow and slippery road conditions. The cause was possibly due to having single-wheel-type tires on dual-type axles. There was no injury sustained by the operator but extensive damage to the tractor cab resulted.

On January 7 at a limestone quarry, a 988 Caterpillar Loader slid into a mobile trailer while attempting to climb a steep grade. This was due to slippery road conditions. The trailer was removed from its foundation and extensively damaged. The loader operator was not injured and only slight damage resulted to the loader.

On January 7 a dozer slid into a feeder hopper at an open-pit coal mine operation, when coal upon which it was working gave way. Standard lock-out procedure was observed and when the paddle-feeder was restarted the dozer operator was not advised. No injuries were sustained during the incident.

On January 10 at a large open-pit mine project, the boom of a crane was damaged when it came in contact with a structural roof member of the concentrator building under construction. The operator had lowered the boom for greasing then raised it again, and continued greasing, oblivious to the fact that the spring-loaded hydraulic control for raising and lowering the boom had failed to return to neutral, and that the boom continued to rise until it struck the roof steel. No one was injured.

On January 10 at a large open-pit mine in the crusher slurry room at a dust cyclone, two persons entered the room to thaw out the dust cyclone water lines. As they approached the cyclone, the burning "tiger torch" set off the vapourizing gas from a liquid propane gas spill. The two persons managed to climb over the cyclone inlet. The third employee put out the fire with an extinguisher. Singed faces and hair was the extent of the injuries.

On January 11 at an underground mine, a drill platform in a 1.05 radian raise collapsed, causing one miner to fall 3 metres to the muckpile in the drift. He received a mild concussion and other bruising injuries. His partner caught a safety chain anchored to the footwall, held on, and escaped injury. Examination indicated that the collapse occurred because the sprag pins were not properly installed, and under load allowed the sprags supporting the platfrom to slip out. Workmen and supervisors are being re-instructed in proper set-up procedures.

On January 14 at an underground coal mine operation, the motor of a main ventilating fan failed. The failure was accompanied by slight smoke which entered the mine. Several hours later, due to the reduced ventilation flow, methane percentages in the mine's main return exceeded 1 per cent (the statutory reportable level under Rule 103 of the *Coal Mine Regulation Act)*.

On January 18 at an underground coal mine, 75 to 100 ppm of carbon monoxide were detected in the return airway. Further monitoring and observation suggested the development of an active heating and eventually an open-flame fire. Subsequent to the fencing of all accesses to the mine, the fire either reached the portal of the return airway or initiated a fire in the portal timber by heat-transfer.

On January 19 at a large open-pit mine, where electrical power is generated by diesel-driven generators sited in a large powerhouse, an operator was alerted by a warning alarm in the control room. A standby diesel engine was found to be on fire. The fire was kept under control by the powerhouse staff until the arrival of the fire department who extinguished it. There were no injuries to persons and damage was limited to minor items on the engine. The fire was caused by diesel oil leaking from a crack in a fuel line and falling onto the engine exhaust. The fuel lines on all diesel units have been replaced as a precautionary measure.

On January 23 at a large open-pit mine, a 45-tonne Pacific truck spun out while carrying a load up a hill. The driver decided to back down to a switchback and try again. In so doing, the truck slid sideways for about 15 metres and came to rest on its side. There were no injuries and very little equipment damage. To prevent a recurrence in the future, when roads are slippery, loaded trucks will be towed by a tractor.

On January 24 at an open-pit mine, a bulldozer operator walked his bulldozer through a loaded drill pattern. No accident or injury occurred. It was found that this bulldozer operator was not aware that Rule 276 of the *Mining Regulation Act* prohibits machinery from being operated within 7.5 metres of the collar of any blasthole which is loaded with explosives.

On January 24 at an open-pit coal mine operation, the valve of a propane tank was broken off when a wooden plank was flipped by a backhoe carrying out snow removal. The area was immediately cleared and the propane allowed to disperse.

On January 25 at an open-pit mine, a production truck which had just been loaded by the shovel began to ascend the ramp. The production truck powered out and started to roll backwards. The application of the maxi and service brakes failed to hold the loaded truck, and it rolled back a short distance, stopping on the flat area of the bench. It was found that the hydraulic brake fittings on both rear wheels had been loosened on the previous shift so that the truck could be towed to the shop. After the motor problem had been repaired no one remembered to tighten the hydraulic brake fittings. A work order and tag-out system attached to the steering wheel has been instituted to prevent any recurrence.

On January 27 in the secondary crusher building at a large open-pit mine, the large hook of the secondary overhead crane fell when it was being raised to place it out of the way of the small hook. As it fell it tore the control pendant from the operator's hand, smashing the pendant and cutting the operator's hand. Both operator and partner were struck on the leg by the cable still attached to the block. The cause of the accident was a jumpered limit switch.

Recommendations

1. Tradesmen (especially riggers and fitters) become accustomed to "fail-safes" as this is a dangerous work atmosphere especially if the equipment is not maintained effectively.
2. A unit, such as a crane, should be cleared, tagged, and logged as safe prior to use, and the defect clearly stated on the log and tag if it is defective, then the foreman give the work crew clearance or deferral as the case may be, and countersigns the log.
3. The position of the crew and person on controls should be stated in the crew meeting before the job starts, and these people should be under observation by an "at site" foreman *at all times*.

On February 4 at a small underground mine, a fire started in the repair shop and spread to the compressor shed. The fire, which was started by welding sparks, destroyed both buildings. Two miners approximately 80 metres underground came to surface as soon as their drills stopped due to lack of air supply. There were no injuries.

On February 4 at a large open-pit waste dump, there was a collision of two dump trucks. One truck was returning empty to a shovel as a loaded truck was approaching a common crossing point over a cable mat. The driver of the empty truck stopped and shut off the truck lights about 19 metres from the mat. The loaded truck proceeded up to and over the cable mat and when the driver of this truck realized that there was a truck about 19 metres directly ahead he tried to change direction, and rapidly cranked the steering wheel to the right. The truck then went into a skid and it struck the stationary truck. There were no personal injuries.

On February 5 in a mill associated with a large open-pit operation, the hoses of an acetylene bottle and an oxygen bottle, respectively, were set on fire by sparks from a welding operation being carried out in the vicinity. The overhead sprinkler system operated automatically and the mill was evacuated. The fire was extinguished by hand with fire extinguishers. Damage was limited to the oxygen and acetylene bottles and hoses. Following this incident, the manager started a program of general instruction relating to the hazards associated with cutting and welding, and the safe use and handling of welding equipment.

On February 6 at a large copper-molybdenum concentrator, two persons were exposed to hydrogen sulphide fumes believed generated from the reaction between sulphuric acid and sodium hydrosulphide reagents, and/or sulphides in the molybdenum flotation circuit. The two were sent to a medical doctor's clinic and subsequently released. Sulphuric acid used to control pH and fed automatically on demand by a pH sensor began flowing prematurely into a partly-filled cell at start-up following a shutdown when the system was reported placed on manual to stop the acid pumps. The hydrogen sulphide sniffer alarm system was activated by the gases generated. An electrical lock-out of the acid pumps is now required. Personnel are being educated to better understand the operating procedures and the hazards. The warning system is being improved with the addition of a flashing light, and the warning sound is being changed to differ from other mill-warning sounds.

On February 10 a shovel at an open-pit coal operation was partially pinned by a slough of rock from the hangingwall above the seam. The slough was due to local steepening of the bedding planes.

On February 12th in the heavy-duty shop of the welding bay at an open-pit operation, the frame of a Lectra Haul truck overbalanced when an attempt was made to move the frame from a flat to an on-edge position. The rigging collapsed and severe damage occurred to an electric welding machine in the immediate vicinity. No injuries were sustained. Investigation revealed that the sling was not adequate to sustain the lift; that the rigging was improper; that the area had not been cleared of workers, and that the job was not under direct supervision as called for by the work method accepted at this mine.

On February 13th at an open-pit property, an explosion occurred in the concentrator building when a spark from a welding operation ignited fumes leaking from a hatch cover on an empty xanthate tanker parked in the building. No injuries resulted from the relatively minor explosion.

On February 18th at a large open-pit operation, a pit supervisor made what could have been a fatal error by parking his vehicle on the blind side of a large haul truck. The supervisor had parked to note some items before they slipped his memory. He felt a sudden jolt and when he looked back he saw the rear wheels of the large haul truck pushing his vehicle. He immediately accelerated and drove his vehicle out of danger.

On February 21st at a large open-pit operation, a 0.90-tonne Ford pickup truck skidded on a slippery road surface and slid into a 1-metre-deep drainage ditch. It was felt that the operator, a field mechanic, was travelling too fast for the condition of the road surface. The operator was not injured and the vehicle received minimal damage.

On February 22nd at a limestone quarry, a 1973 model ½-tonne pickup truck was parked approximately on a 2-per-cent downslope near the jaw crusher. The engine was shut off and the unit was left in second gear. An hour later it was noticed the pickup truck had moved about 50 metres and at that time rolled over the bank. The pickup was damaged beyond repair. Subsequent investigation revealed that the brakes were not set and the wheels were not blocked. There were no personal injuries and there were no witnesses to the actual occurrence. Employees were instructed to set brakes and block wheels when vehicles are required to be left unattended.

On February 27th at an open-pit mine, a loaded 109-tonne truck crossed a haul road, travelled through a 1-metre berm and rolled over onto an access road 6 metres below. The operator was apparently cleaning up the interior of the truck cab while in motion, in preparation for the end of the shift. The operator suffered a bruised left knee and the truck received minor damage.

On March 8th at a large open-pit mine, the operator of a 91-tonne Lectra Haul truck picked up a full load of fines near the mill and proceeded to the haulage ramp into the pit. The operator apparently broke over the top of the ramp at a rate of speed excessive for loaded downhill hauling and when the dynamic brake system failed to retard the truck he attempted to slow down by pumping the air brakes. The truck ran away approximately 350 metres down a minus 10-per-cent slope, finally going through an impact barrier at a switchback and running up a pile of waste rock at the pit wall. The truck was very heavily damaged and, except for a bruise on the head, the operator was uninjured. The operator had two weeks' experience and had never driven air brake-equipped vehicles before. Despite a company rule that placed a limit of three-quarter loading for down-pit hauls, the truck was fully loaded.

On March 10th at an open-pit mining operation, a D-8 dozer travelling "cross-country" between two waste dumps accidently ran into a cap storage magazine. There was no damage to the dozer and minor damage to the magazine. Warning signs have since been erected in the vicinity.

On March 11th at a large open-pit mine, a Lectra Haul No. 122 started to pull away from the shovel. After moving a short distance the truck stalled. In his rear view mirror the driver of Unit No. 134 observed No. 122 pull away. He commenced backing up and backed into the driver's door of the then-stalled Unit No. 122. There were no personal injuries but extensive damage was done to the truck cab. The operator was reprimanded and other operators have been shown the preferred position of a truck waiting to back into loading position.

On March 11th at a coal operation, a fire developed in a coal-conveying rock tunnel affecting the timber cribbing. The fire was brought under control and only minor damage was caused to the support timbers. Spontaneous heating or incendive sparking from conveyor rollers could have been the possible cause. No persons were injured during this occurrence.

On March 17th while working alone at a small sand and gravel washing and screening operation, a truck driver received abrasions to his left arm, leg and posterior when his raincoat caught in the operating drive shaft of the plant's conveyor feed belt. Fortunately, his clothes burned through and he was able to go to a truck equipped with a radio telephone and call for help.

On March 18th at an open-pit coal operation, damage to equipment occurred due to road traffic congestion caused by a grader working on a haul road. The driver of one truck stopped when just starting to overtake a grader, when he observed another truck coming in the opposite direction. Due to running back, this shortened the stopping distance of a truck travelling just behind which collided with the rear of the truck attempting to pass the grader.

On March 19th at an open-pit mine, the driver of a 155-tonne haul truck fell asleep while hauling a load of waste toward the waste dump. The truck entered a 0.3-metre drainage ditch and travelled 54 metres along the ditch until sufficient muck built up to cause the truck to turn sharply to the left and stop up against the embankment. There were no injuries sustained by anyone.

On March 19th at an open-pit mine, a mine operations lead hand was driving a pickup truck along a level haulage road toward the waste dump. A D-9 Caterpillar Ripper-Bulldozer was being used to slope the ditch at the edge of the road. The lead hand pulled up beside the bulldozer, got out of the pickup and proceeded around the front of his pickup truck. The lead hand intended to talk to the operator of the bulldozer. At this point the bulldozer operator put the bulldozer into reverse with the left steering clutch disengaged. As the bulldozer swung, the edge of the left bulldozer track crumpled the right side of the pickup truck. There were no injuries sustained by anyone.

On March 26th at a large open-pit copper-mining operation, a mechanic was partially caught between a 2700-49 wheel from a 91-tonne truck and the carriage of a tire manipulator which had been holding the wheel. The mechanic was installing new bearing cups in the wheel hub when the tire came free of the manipulator clamps and fell toward the machine carriage, pinching the mechanic's head between tire and carriage. The injured man was taken to hospital by ambulance and was sent home the same day after treatment of minor cuts and abrasions.

On March 26th at a small open-pit operation, a 6-cubic-metre diesel-engined scooptram was being used to haul molybdenum ore. The machine was stopped during the lunch break and on being restarted, a fire broke out in the hydraulic compartment, adjacent to the operator. The operator immediately activated the fire-suppression system but this did not completely extinguish the fire. The fire was finally extinguished by use of portable extinguishers and dumping snow onto the fire. There were no personal injuries. The conclusion of the investigation after the incident suggested that the heavy-start current created an arc which ignited oil accumulations within the hydraulic compartment. To prevent such incidents, more regular inspection and maintenance of the electrical circuitry and cleaning of the hydraulic compartment is to be done. Further, the nozzles of the fire-suppression system are to be repositioned for better coverage.

On April 4th at a large underground operation, a 988B loader was drawpoint mucking for approximately three hours. Shortly after 1100 hours the drawpoint hung up and the loader ventured too far into the drawpoint in an attempt to bring down the hang-up. The hang-up dropped on the elevated bucket burying the front end of the loader and driving the rear portion into the back. Extensive damage was done to the loader. The operator was not injured.

On April 4th at a surface operation, a tailings operator received severe burns to his face and neck, right hand and forearm, and other minor burns when a jerry can containing gasoline caught fire as he was slashing the fuel on smouldering logs. Company regulations forbid the use of gasoline for brush burning and the splashing technique of fuel application to any fire.

On April 5th at an open-pit coal operation, the steering of a Wabco truck failed while traversing a rough section of road on the way to the spoil dump. The truck went out of control and ran into another truck coming in the opposite direction. On investigation it was found that the steering failed due to the failure of the bolts holding the left side subframe to the bumper. Modifications were carried out and repairs done to secure the frame-bumper assemblies and to reduce possible slack in the rubber mount assemblies.

On April 11th at an open-pit operation, two welders inadvertently holed a 13-kilogram propane tank and ignited the gas, while carrying out air-arc welding in a tent over the car body of a shovel. The welders escaped with minor injury and slight burns. Damage to equipment was negligible. The constant and necessary precautions to be taken with propane has again been emphasized.

On April 11th in an underground metal mine, an electric trolley locomotive ran into the rear of a battery locomotive as both were travelling into the main haulage drift. There were no injuries to the persons riding on the locomotives and neither locomotive was damaged. The accident was caused by the failure of the locomotive operators to obey the vehicle rules in force at the mine. A program of retraining and examination of the locomotive drivers has been instituted.

On April 13th at a large open-pit operation, a Wabco truck was being driven down the main haulage road when the operator noticed that under the dash there was some arcing in the electrical wiring and almost simultaneously the engine stopped. Because the truck was on a downgrade, it started to accelerate. The driver activated the emergency steering (which he had checked at the beginning of the shift) but found it inoperative. The brakes were applied and the truck went into a skid. When the brakes were released, the truck continued down the slope in a direction opposite to the pit wall and came to rest against a full tank. The full tank burst open but fortunately no fire ensued. Subsequent investigation showed that a short in the light switch arced over to other wires under the dash. As a result, the following action will be taken:

1. All Wabco trucks will have their electrical systems reviewed and will be rewired where necessary.
2. When trucks are brought in for servicing, a much more thorough inspection of the electrical systems will be made.

On April 18th at an open-pit coal mine operation, a driver of a truck misjudged the distance between his truck and a grader while reversing on the blind side and collided with the blade of the grader. There has been a re-enforcement of the rule for drivers not to back up with equipment on the blind side. A new parking area has been provided with additional space.

On April 18th at an open-pit coal operation, the mast of a drill rig touched powerlines, thus kicking off the power on the primary side of the transformer in the substation. No persons were injured during the incident, but slight damage was caused to one phase of the powerline.

On April 23rd at an open-pit operation, a Wabco truck went into overspeed when the dynamics brake system failed. At the time a personnel bus was approaching, but the truck operator was able to bring the truck to a stop using the service brake and the roadside berm. On investigation it was found that a broken wire existed in the circuitry of the dynamic braking system.

On April 25th at a large open pit, a truck hauling waste rock up the main haulage road ran off the road over a 0.9-metre-high berm on the left-hand side of the road. The truck overturned several times in travelling at least 150 metres to the bottom of the embankment and in so doing broke up into many pieces. The operator managed to jump clear of the truck and he landed about 105 metres down the slope. He received a fractured right ankle, multiple bruises and lacerations. There were no witnesses to the accident and subsequent investigation showed that there were no skid or slide marks and as far as could be determined no failure of the steering system of the truck.

On April 30th in a large open-pit copper mine, a section of the highwall broke away and struck the rear end of a 90-tonne Lectra Haul truck. The truck was waiting to be loaded and was parked near the shovel. The damage to the truck was minimal with one cab brace broken. Investigation showed the presence of a fault in the face angling back from the toe. The material apparently fell when cohesion was lost on the fault plane.

On April 30th at the townsite construction site of an open-pit mine in the pre-production stage, a faller was working on burning of slash. He was adding fuel to a slash fire directly from the fuel tank. His clothing caught fire causing second degree burns. Workers advised that under no circumstances was the fuel to be added to a slash fire directly from the fuel truck.

On May 3rd at an open-pit coal operation while energizing a drilling rig after changing rotation, an electrician, on checking a 400-amp disconnect switch and following the procedure of tripping the circuit breaker, jumped back out of the switch house, bruising his knee when the drill was started up and the switch was still energized.

On May 4th at an underground coal mine during normal dump maintenance, a D-9 dozer reversed back into a fuelling vehicle which had parked out of vision to the rear of the dozer. Minor injuries resulted.

On May 9th an unexpected detonation occurred at an underground primary crusher within ore being crushed. The ore had been drawn from the portal stockpile, being a blend of ore from different areas of the mine. The crusher operator was not injured and no visible damage was done to the crusher. An investigation of the blasting procedures at the mine is in progress.

On May 10th at a coal operation, a dump truck ran out of control due to cumulative conditions and illegal procedure, going uphill through a safety berm and down a 10.5-metre embankment. The operator was found in a dazed state, having reportedly lost consciousness just prior to the accident. This dazed state could be attributed to the operator just having got over the flu, and exhaust emissions migrating from a faulty gasket into the cab, which was reported at the start of the shift. From examination of the cab, a piece of wood was found wedging the accelerator pedal which would cause the truck to continue moving forward, even though the operator was in an unconscious state.

On May 11th in a large open-pit asbestos mine, an apprentice mechanic, who was a member of a three-man maintenance team working in a 1900 AL shovel, received a high-voltage shock when he came in contact with the slip rings of an electrical motor which operated at 4160 volts. He received burns to both hands and some bruising. The accident was the direct result of the failure to isolate the electrical equipment in the shovel before commencing work. Following this accident all maintenance personnel are being re-instructed as to the proper lock-out procedures.

On May 12th a fire occurred in the engine compartment of a loaded 91-tonne haulage truck while climbing a ramp between the open pit and crusher dump. The truck was prevented from rolling down a steep bank by a 2-metre safety berm. The cause of the fire was determined to be a ruptured oil pressure line but the driver was deemed to have reacted improperly in not stopping immediately to extinguish the fire.

On May 15th during underground coal-mining operations, a hole was blown in the outer sheath of a trailing cable. No injuries resulted from this incident.

On May 18th the mill-shift foreman entered the concentrator building of a large open-pit copper mine and he smelled H_2S gas. He immediately shut off the acid pump and evacuated the area affected. No persons were injured or suffered ill effects. The build-up of H_2S would not have created a hazard had the system of ventilation for the building been the permanent one. The temporary system allowed some re-circulation into the concentrator building from the outside of the building. The investigation revealed that the pH probe in the tailings section had sanded up and caused a false reading in the control room. The reading shown was 8.0 whereas the correct reading was 4.4. As a result the H_2S readings were fluctuating erratically for some hours prior to the incident but the operator did not report them to the supervisor. Following the incident it has been decided to try to make the system less dependent on human control. The new measures will include better ventilation from hazardous areas, dual instruments in the control panel, more training of operators to interpret readings, provide additional H_2S detections and reposition the pH detector.

On May 20th an unexpected explosion occurred at the underground primary crusher within the ore being crushed. The whole area was inspected and a partial cartridge of explosives was found in the stockpile between the primary crusher and the cobbing plant. Precautionary measures were implemented immediately warning the development crews and loader operators about the hazards involving missed and cut-off holes. Occurrence of two incidents of this nature within two weeks indicates that much greater care in the handling of explosives is required.

On May 22nd at an underground mining operation, smoke was noticed coming from the roof of the temporary powerhouse. Due to a heavy load the No. 1 engine exhaust stack had overheated and set the wood near the roof outlet on fire. The fire was extinguished utilizing the carbon dioxide and dry chemical extinguishers. To prevent a recurrence a larger opening stack will be installed and mechanical ventilation in the roof area provided.

On May 27th in the concentrator of an open-pit mine, a crew was changing liners in a ball mill. A gantry was constructed over the mill to aid in liner positioning. Attached to the gantry beams by 4.5-tonne trolleys were two crane beams. While a liner plate weighing approximately 1100 kilograms was being lifted, the trolley at one end of the crane beam spread apart allowing the crane beam and liner to fall. The trolley on the other end of the beam then bent and the beam came down on top of the mill. No one was struck by the falling beam and liner. Subsequent investigations indicated that the trolleys would fail at less than one-half of their rated capacity. These are to be replaced by trolleys of a more competent design.

On May 30th a driver for a construction company which was contracted to supply fill to an earth dam, drove a water truck at low speed too close to the edge of the fill. The front wheels of the truck went over the edge and subsequently the truck rolled down the embankment. The driver suffered no injury. Some damage occurred to the cab of the truck.

On May 30th at a large coal-mining operation, the operator of a 182-tonne truck backed up and ran over a 0.45-tonne pickup truck. This occurrence can be directly attributed to poor communications between the supervisor and the operator of the truck as the supervisor did not receive an acknowledgement to his instructions not to back up. Secondly, the supervisor disregarded the company safety rules regarding parking to the rear and front of the dump truck in areas where limited visibility is known to exist.

On June 4th at an open-pit mine, an 18-tonne Grove Rough Terrain Crane Model 620 was used to carry a replacement ladder to the coarse-ore drive tower. The distance was about 90 metres. The replacement ladder was put in position and the old ladder was hooked. The operator swung the ladder 6 metres and was laying the ladder down when the machine tipped. The operator's lower right leg was pinned and broken. The cause of the accident was an extended boom without the outriggers in place.

On June 6th at a dry construction site of a large coal-mining operation, a crane toppled over during the pouring of concrete. The crane had not been properly set up with outriggers fully extended and the feet on stable ground. During a change in direction the crane toppled over. There were no injuries as a result of this incident.

On June 6th at a coal-mining operation, a dump truck collided with a powerline as it moved forward when unloading during the construction of a level pad for maintenance on a shovel. This caused a disruption of power to an operating shovel. Electricians attempted to reset the power supply at the mine substation without further checking the cause. This caused the powerlines to spark on the body of the truck. No injuries resulted from this incident.

On June 6th at an underground mine in pre-production stage, a dangerous occurrence took place when the portal caved, resulting in an 136-tonne rock fall. There were no injuries or damage to the equipment.

On June 9th at a large open-pit operation, a 4.6-metre 988 Cat loader was operating on the lower dump. While backing away from the berm, the right rear wheel fell off. The machine settled slowly and the operator did not suffer any injury. Examination subsequently revealed a fractured wheel spindle. It is noted that this is the first indication of spindle failure in this particular machine in ten years of operation.

On June 10th at a large surface operation, the right front suspension of a large haul truck dropped off after the suspension bolts sheared off when the loaded truck made a sharp turn. Evidence of rust indicated that one of the suspension bolts had failed sometime prior to this incident, thus putting more stress on the remaining bolts. Further examination indicated that bolts inferior to the factory and company standards had been used. The flat washers used were found to be softer than the bolt heads and probably allowed the torque to relax and the bolts to loosen. An optimum bolt/washer is required to preclude bolt failures. Nuts were also mismatched. The company is checking each truck to ensure proper bolts, washers and nuts are being used. The warehouse is also being advised to ensure that proper components are stocked and issued.

On June 11th at an open-pit mine, two electricians were testing a 154-tonne Lectra Haul truck on a -10 per cent ramp in an unused pit. It had been raining and because the ramp was not being used, the travelway was slippery. Before reaching the bottom, the driver lost control, slid over a 0.6 to 0.9-metre berm, and nosed into the wall of the pit about 1.8 metres from a mini-substation. There were no personal injuries. The operator, not being an experienced driver, should have gone only to the crest of the ramp.

On June 20th, a 1.5-cubic-metre capacity Jarvis Clark scooptram was being used to carry ore from an underground drawpoint. After filling the bucket with a large piece of muck, the operator backed the scooptram away from the drawpoint. As the machine was swinging into the main haulage drift, the large piece of muck shifted and caused the scooptram to topple on to its side. There were no injuries to persons or damage to the scooptram. In order to try to prevent future incidents, operators are being instructed on the manner of moving after filling the scooptram at drawpoints.

On June 26th at a mine construction site, a crusher chute liner weighing more than 1500 kilograms, and held by a mobile crane located outside the crusher building was being manoeuvered into place by two workmen. The injured workman had positioned himself with his back against a beam to provide the leverage to keep his end of the liner in alignment. The workman aligning the other end signalled a "down-easy" sign to the signalman who relayed the signal to another signalman who, in turn, signalled the crane operator. The liner was lowered into place, but after seating itself, the crane continued to lower sufficiently to allow the liner to tip outwards on its seat until it pinned the victim against the beam, causing serious injuries to his arms and body, before the "stop" and "go up" signal was received. The accident resulted from the signalling system used. Radio is now being used for communication in such blind situations.

On July 2nd at a large surface operation, the right front wheel fell off under a loaded haul truck after the cap screws holding it had sheared off. The operator was turning the wheels readying the truck to back up to the dump when the incident occurred. No one was injured. The accident is attributed to manufacturer flaws in the bolts.

On July 4th at an underground mine, a 1.8-metre Jarvis Clark scooptram upset landing on its side. When the incident occurred the operator was backing out of a drawpoint with a full bucket of muck in the elevated position. As the unit was swinging into the main haulage drift, it upset. There were no personal injuries and minor damage was done to the exhaust system of the scooptram.

On July 7th at a surface coal-mine operation, one procore and 2.4 metres of scuflex were found in the back of a pickup as the vehicle was being released from maintenance. The company has been unable to determine how, by whom and when the explosives were placed in the box.

On July 7th three employees were sprayed with sulphuric acid at a concentrator of an open-pit mine. Two were not injured, the third remained in hospital for some time with burns to the head and arms. A semi-trailer tank was being used on a temporary basis while maintenance work was being done on the main storage tank. The three employees were repairing a coupling in the line from the trailer tank without closing the valve at the tank. During this process a nipple broke resulting in the workmen being injured.

On July 9th at a large underground coal operation, during a supplies operation, a Hunslet tractor went out of control due to a hose failure on a hydrostatic motor. The operator had failed to use the braking system. The hose of the motor was found to be of non-standard type installed by an unauthorized person. Superficial injuries to the operator resulted from the occurrence.

On July 11th at a large open-pit mine, a loaded 59-tonne Terex truck pulled away from the shovel and proceeded up the ramp. After moving a short distance, the motor lost power, the truck rolled backwards a short distance and turned over on its side against the berm. There were no personal injuries and only minor damage to the truck. Examination revealed an empty fueltank. All operators were requested to improve operator vigilance and pre-start and post-start checks.

On July 13th at a large surface operation, the operator of a haul truck felt the vehicle sinking while backing up to dump. The operator shifted the gears to move forward, and when the truck failed to move the operator abandoned the vehicle. The operator received minor injuries to his feet and leg when he jumped from the truck ladder. The truck moved about 6 metres downward with about 10 metres of dump as it sloughed and settled. The equipment was not damaged. No cracks were observed prior to the incident. The slough was thought to be caused by excessive moisture in the fill and was probably triggered by the weight and movement of the truck. The area is to be more closely monitored and the lifts will be carried at shallower thicknesses.

On July 16th an electrician, at a large open-pit copper mine, received minor burns to his right hand while examining the high-voltage slip-ring housing on a P & H shovel. A flashlight held in the workman's hand came in contact with a housing bolt which was in contact with one or more slip-rings that had broken from a mounting flange.

On July 19th the operator of a Dart D600 Loader sustained three cracked ribs and a mild concussion when he jumped out of a vehicle which was on fire. Investigation would suggest that a ruptured hydraulic hose sprayed oil onto an overheated park brake. The operator, in his haste to vacate the vehicle, pulled the wrong end of the chain leading to the pin of the automatic fire extinguisher. Control of the blaze had to await the arrival of the fire truck.

On July 20th at a large underground coal operation, while parking up behind another full dump truck, extensive damage occurred to the cab of a truck when it overran and collided with the rear of the parked vehicle. No injuries resulted from this occurrence.

On July 22nd at an open-pit mine the driver of a 110-tonne haul truck had hauled three loads of waste rock to dump at a new road that was being built. On each of the three loads he had been guided by the bulldozer operator while backing up. When he returned with the fourth load the bulldozer operator had moved over to push some material at the backhoe. The truck driver turned the truck and backed up for 30 metres, stopped and waited to decide whether to dump the load or to wait for the bulldozer operator. However, although he was not close to the end of the road, he was too close to the edge on the right side of the truck. After a few seconds the right rear wheel settled. In 10 seconds the side of the truck settled and then rolled over for one full turn and back onto its wheels. The driver was wearing his seat belt and received only a small scrape and a bruise. The truck received damage to the cab. The accident would have been prevented if the driver had waited for the bulldozer operator to guide him while backing up.

On July 29th in a mill at an underground mine, a workman was removing wet muck from under a conveyor when a wall stud released from a metal crossbrace. The flooring dropped about 150 millimetres before a section 7.93 metres by 3.65 metres fell 3.65 metres to the ground. No persons were injured. The probable causes of the collapse of the floor were deterioration of the timber and a build-up of wet muck causing an unusual floor load.

On August 6th at the tailings pipeline construction area of an open-pit mine in the pre-production stage, a dangerous handling of explosives was noted. A two-man crew was working on the excavation of the footings for the tailings pipeline supports. The safety supervisor discovered half a case of high explosives stored inside the running compressor. Also, fourteen electric detonators were stored inside a steel pail, hanging outside the compressor. The blasting foreman, being inattentive and negligent in the execution of his duties, had his blasting certificate suspended for a six months' duration.

On August 11th at a surface mining operation, a welding truck was being backed up under guidance of the welder standing in the clear under the shovel house. When the truck was within 0.5 metre of the shovel one of its wheels dropped into a hole, and as the truck was equipped with an automatic transmission, it came to a halt. The driver then diverted his attention to accelerating out of the depression. At the same time the welder decided to walk through the 0.5-metre opening between the truck and shovel. With the added acceleration, the truck darted backward pinning the welder against the tracks of the shovel before the driver could react quickly enough to brake. The welder suffered a broken pelvis.

The accident is a result of unsafe acts by both persons and is being used as a subject for safety discussions on the property.

On August 22nd at a construction project at a large open-pit mine, the boom of a concrete pump truck collapsed and fell to the ground. One person received a glancing blow off his shoulder from a falling hose. He reported to first aid but did not require further treatment. At the time of the incident the boom was swinging out and not pumping concrete. The cause of the accident was the failure of the lower boom through the pipe section. The failure occurred in front of a previously welded full section of the pipe. The investigation also revealed other items in disrepair, but which probably did not contribute to the accident. The incident points out the need for close inspection of concrete pumpers similar to those required for cranes before they are put into service.

On August 31st at a surface mining operation, a Dart loader was building a ramp up a crushed-ore stockpile when it broke through into one of three reclaim tunnels beneath the stockpile. An electrician working in the reclaim tunnel was trapped behind the caved section until the loader operator was advised to stop working. No injuries to persons resulted from this accident.

On September 5th at a large open-pit mine construction site, a workman suffered fractures to both feet when he jumped about 3 metres to ground level from a conveyor gallery section which was suspended from a mobile crane. The injured workman and four other construction workers were riding the gallery section to assist in alignment and positioning when the crane started to tip. When the crane operator began lowering the load, however, the one workman decided to jump receiving subsequent injury.

On September 10 a fire started in the powerhouse of a large open-pit mine. The fire was caused by a 1.27-centimetre lube oil line coming apart at the main outlet of one of the motors. This line, which is pressurized to 42.18×10^3 kg/m^2 sprayed oil upward to the manifold and exhaust intake of the turbocharger. One workman received first- and second-degree burns to both his hands. Damage is estimated at $50,000.

On September 10th smoke was noticed coming from the roof of a temporary powerhouse at the mine site of a large-tonnage underground mine. The engine exhaust stack had overheated and set the wood near the roof outlet on fire. The fire was extinguished utilizing the carbon dioxide and dry chemical extinguishers. To prevent a recurrence, a larger stack opening in the roof will be installed and mechanical ventilation in the roof area provided.

On September 10th at an open-pit mine construction site, a 29-tonne section of autogenous mill liner fell 5.5 metres to the floor of the concentrator building during the mill assembly process. Lifting lugs on the shell section, rated at 47 tonnes, failed during the lifting operation. Damage was limited to the shell section and the concrete mill floor.

On September 12th a mechanic employed by the mining contractor at a medium-sized gold mine in pre-production stage was injured while replacing a tire for a pickup truck. Employee received a fractured arm and multiple bruises when the side wall of the tire blew out when he was filling the tire. The placing of the wheel assembly in a safety cage would have prevented the accident.

On September 13th a fire started in the roof area of a temporary powerhouse at the mine site of a large-tonnage underground mine. It was totally aflame within a few minutes and despite fire-fighting efforts there was no chance to save the building. It appears that the fire started in the roof area from an overheated engine exhaust stack. The recommendations on two previous fire incidents of a similar nature were not followed up.

On September 14th at an open-pit copper mine, a 91-tonne haulage truck upset while dumping over the edge of a stockpile near a portable crusher site. The crest of the dump, which was 3 to 4 metres in height, broke away on one side causing the truck to roll over, resulting in no injury to the driver and only minimal damage to the truck.

On September 20th at an open-pit copper property, a water truck was being towed by a dozer up an 11-per-cent grade when a 2.54-centimetre shackle pin failed on the towing cable. The driver did not apply the emergency braking system, but he jumped from the runaway truck and received a fractured ankle. The vehicle left the road and went 100 metres down a steep embankment receiving an estimated damage of $100,000. Failure of the shackle pin is being investigated and towing methods and equipment are being reviewed.

On September 21st at a surface coal operation, a dump truck operator's attention was momentarily diverted, and the truck veered to the right-hand side of the road into the berm. The driver powered the truck to try and get clear but the right rear Hydrair rear-suspension studs broke and the left studs bent.

On September 22nd at an active dump area of a surface coal-mining operation, a fuel truck, while reversing, collided with a dump truck which was passing to the rear prior to dumping. Superficial damage to the dump truck occurred due to the collision.

On September 22nd at an open-pit coal operation, a worker was placing a shovel cable on security stands when the connector between the cables blew apart. No injuries resulted from the incident.

On September 22nd at a limestone quarry, the driver of a 32-tonne truck lost control of his vehicle when he was distracted as the door of the glove compartment flew open, causing the contents to spill on the floor. He was attempting to pick up the articles and the truck swerved and the right wheels dropped over the shoulder of the road. The truck stopped and then rolled down a 3-metre bank coming to rest upside down. The driver received no injuries as he was wearing his hard hat and seat belt. The truck's glove compartment will be welded shut to prevent a recurrence of this incident.

On September 24th at a large open-pit mine, a 31.8 tonne P & H crane tipped on its side. There were no injuries. Apparently, the crane was left unattended on relatively flat ground without wheel chocks, the parking brake was not engaged, the transmission was in neutral, and the stabilizers were not down.

On September 24th, at a large open-pit mine, a haulage truck broke away from a Cat while being pulled up a ramp. The truck came down the ramp out of control, and collided with cribbing surrounding a power pole at the bottom of the ramp. There were no injuries.

On September 25th at an open-pit mine, a P & H Crane Model W350 was being used to remove a pump motor from the tailings pond recovery pump house. The motor suddenly dropped 2.1 metres to the deck. On investigation it was found that the unit had been used the previous day, and the fly section had been extended. Although the boom pin had been replaced on re-telescoping the fly section, the pin had not been replaced into the cylinder rod eye. Subsequently, on using the boom the cylinder eye slipped over the pin allowing the second section of the boom to telescope, causing the load to drop. There were no injuries, and the operator was severely reprimanded for his carelessness.

On September 25th at a large surface operation, a newly trained operator on an M-85 Lectra Haul was making a turn preparatory to entering the dumping point, when the truck failed to come to a stop, passed over a berm, and down a 2.1-metre embankment. The driver was not hurt and the truck sustained some minor damage. On testing the brakes, all were found serviceable and effective. The operator apparently misjudged the situation and applied the dynamic pedal rather than the brake pedal. The operator is being retrained.

On September 25th at a gold-mining operation, two employees were overcome by chlorine fumes. The employees were hospitalized overnight then released with no after-effects. The incident occurred while changing the feed valve from one cylinder to another. The feed nut was put on cross-threaded with the result that when the main valve was opened chlorine leaked past the valve seat.

On October 4th at a coal preparation plant site, while kneeling down doing survey staking duties, a worker received severe contusions to feet and legs when run over by a 631 scraper which was backing up during site grading and excavating work.

On October 5th at a large open-pit mine, the right front wheel assembly of a large haul truck fell off while making a right turn prior to stopping and backing into the crusher dump. Since the speed at the time was almost zero, little damage occurred and no one was hurt. The wheel fell off when four bolts holding the bearing retaining plate to the wheel spindle broke off at the spindle end face. Preliminary examination of the bolts by a materials testing firm indicated the bolts failed in tension as a result of an overload in an axial direction. They also found small cracks at the thread roots of the bolts. The bolts are believed to have pulled apart due to side loading during the low speed turn when the front wheels were in a full lock position. The company is awaiting a full report from the materials testing firm.

On October 8th at a coal operation, while in steam bay for cleanup, the box of a Wabco truck was raised, striking an overhead crane which was being positioned to do preventive maintenance check.

On October 10th at a combined underground and open-pit operation, a vehicle drove through the stop sign on the open-pit road and hit the rear of a vehicle going past the intersection to the mine dry. No one was injured.

On October 15th at a large open-pit metal operation, an empty Lectra Haul truck being driven down a 10 per cent grade access road failed to negotiate a left-hand curve. The truck drove over the berm and came to rest on the embankment adjacent to the road. The braking systems were checked and found in good order after the incident occurred. The cause of the incident is attributed to error of judgment.

On October 17th at a coal operation, an electrician received first- and second-degree burns to the body when he caused a short circuit as he was checking out the circuitry on the dragline.

On October 17th at a large coal mining operation, while backfilling a hole on a steep slope, the reverse gear on a backhoe slipped out causing the operator to use his brakes. Due to being individually operated, uneven pressure caused the backhoe to slough and drop over a one-metre bank, and finally tip over. No injuries resulted from this accident.

On October 21st a 45-tonne ore car and loci overturned at the surface waste dump of a large underground mine. The car was filled up with wet spill muck, and the unbalanced load caused the accident. The operator left the loci prior to the dumping of the car. There was heavy damage to the car and loci.

On October 23 at a large open-pit mine, an accident occurred without injury to anyone when the axle box and rear wheels of a large haul truck broke away from the rest of the unit. At the time the truck was proceeding downhill at approximately 10 kilometres per hour fully loaded, and settled immediately on the ground when it lost its rear wheels. Damage to the vehicle was substantial. The accident resulted when the cast steel bracket attaching the nose cone to the axle box broke. Non-destructive tests of similar castings on other haul trucks showed the presence of minute cracks, which it is believed may have increased on the damaged truck to a size insufficient to support the stresses of load and haul conditions. Those other trucks on which cracks were discovered were also shut down. The manufacturer is providing an interim fabricated rather than cast unit until a final solution is found.

On October 23 at a coal operation, a crane slid to the side of the road during a moving operation. A front-end loader and a wire rope were used to hold the crane from slipping further. When the crane was secure the crew left for lunch without posting warning signs. A loaded concrete truck on its way to the coal operation struck the rope and demolished the cab of the truck. The driver, having seen the rope at the last second, dropped flat onto the seat and only received scalp lacerations.

On October 24 at an open-pit coal operation, due to the operator pushing the wrong lever on a drill rig, a workman releasing the sand line to the top of the head nearly fell when the head dropped.

On October 25 at a large open-pit metal operation, a person employed as a waste dump supervisor placed herself in an extremely dangerous position, while allegedly under the influence of alcohol or drugs. The person while in this allegedly impaired condition ran in front of an 11-tonne truck causing the truck driver to emergency brake to avoid accident. The person was escorted to first aid and then off the property.

On October 25 while erecting a new storage building at a coal operation, an ironworker's apprentice, without being fully aware and thinking as to his whereabouts, took a couple of steps backwards while on the roof and fell to the ground. The fall resulted in a fractured elbow and pelvic bone.

On October 28 at an old abandoned underground mine, a collapse of ground to the surface occurred due to spontaneous heating. This mine was sealed off in 1934 following an extensive fire underground as a result of the coal seam heating up in an area of the mine.

On October 29 at a large interior quarry, a 100-tonne haul truck was in a collision with a small compact car, when avoiding wild sheep on the road. The car was completely demolished and the driver was unhurt. The impact caused the tractor and the trailer of the truck to separate and the trailer when ahead running into the cab of the tractor, imprisoning the driver. The driver's left leg was severely damaged below the knee. All drivers have since been cautioned that animals on the road are expendable, and steps are to be taken to stop unauthorized vehicles from entering onto this private industrial road.

On November 2 at a coal mining operation, while manoeuvering into position alongside a loading shovel, a dump truck tire blew, hurling a rock through the shovel window. The shovel operator received a piece of glass in his left eye when the window shattered.

On November 3 in the mill of an open-pit mine, a carpenter was assisting to move a steel I-beam which was to support the base of a new fan. In order to lift the beam it had been suspended beneath the forks of a forklift. When the beam had been raised about 1.8 metres above the floor the workmen attempted to slide the beam out of the suspension chains. This action dislodged a fork from the forklift, the beam fell, and struck the injured man on his left foot. He received a fracture of three bones. The use of a forklift for lifting a beam in this manner is to be severely criticized. The manager has taken up the question of correct procedures with regard to lifting such equipment.

On November 3 at a surface coal operation, a dozer was being used to clean up for a shovel when the shovel bucket was swung and hit the dozer, causing minor damage. No injury resulted from this incident.

On November 5 while assisting a drilling rig to reposition a drill, an oiler fell down a collapsed hole and managed to hold himself 2 metres down from the top of the hole. Prompt action by the drill operator in attaching a line to the oiler and rescue by the mine rescue team avoided a nasty occurrence from being extremely serious.

On November 7 at an open-pit copper property, a collision occurred between an M-100 haulage truck and a mechanic's service vehicle. The haulage truck, returning to the pit, had stopped to allow room for a loaded truck to return to the load lane after passing a parked, broken-down haulage truck. The accident occurred when the returning truck, in backing up to provide more room for the manoeuver, collided with the mechanic's vehicle which had stopped in the blind spot behind. About $2,000 damage resulted to the smaller vehicle.

On November 16 at a surface coal operation, a backhoe caught and fractured a gas line when lowering a manhole outside the mine maintenance shop.

On November 18 at an underground mining operation, a worker was barring against a steel plate which he was standing on and pushed it off the supports. The worker fell 7 metres to the ground on the steel plate in approximately a standing position. The worker suffered a compound fracture of the right ankle, a simple fracture of the left ankle, and a fracture of the right wrist.

On November 20 at a large interior underground mine, a fire broke out when hot slag from a burning operation ignited varsol-soaked rags which had been used for cleaning the previous day. These rags were left in the corner of the concrete work area. No injuries were sustained. The fire was extinguished with a dry chemical extinguisher. Measures have been taken to assure that burning or welding will not be done in the presence of flammable material. Rags containing petroleum products are not to be left lying around, but are to be put in the approved fireproof container and removed from the working place.

On November 20 at a large open-pit mine, two haul trucks collided resulting in extensive damage to one unit, and minor damage to the other. No one was injured. The accident occurred on a level area when a loaded truck went out of control and swung into the other traffic lane to collide with an approaching empty truck. The operator of the truck causing the accident claims he dropped a cigarette around his crotch area, and while trying to locate it his truck crossed into the other traffic lane causing the accident.

On November 22 at a surface coal mining operation, while loading large rock to the tailend of the dump truck box, the truck moved off before the shovel could position the rock further into the centre. Both hydraulic rams were damaged when the box flipped up. The driver received concussion and contusions to the forehead.

On November 25 at a large open-pit mine, the auxiliary hoist ball of a 104-tonne crane came in contact with a high voltage powerline. There were no injuries. The crane was being used to lift a 17½-cubic-metre shovel bucket onto a low-bed for transportation to a repair site. The operator of the crane indicated that he had walked and looked over the work area, and was aware of the nearby overhead wires, but had forgotten about them while backing up and swinging the boom into position. He also indicated that visibility was impaired because of darkness, and also because he had to swing through the blind side since another smaller crane was parked on the other side. The supervisor has re-instructed operators regarding lifts in the vicinity of powerlines.

On November 28 at a surface coal-mining operation, while dumping large frozen coal at a stockpile against previous orders to the contrary, a dump truck's rear wheels settled down over the crest of the pile. This was due to the dump being depleted on the previous shift and altering the angle of repose steeper than normal. No injuries resulted from this occurrence.

On November 29 at a coal-mining operation, while manipulating a truck tire base onto a mounting stand, a workman received a broken arm and leg when the base became dislodged from the carrying hook and fell back on him.

On December 1 a capacitor containing PCB was knocked down by the carpenters working at the concentrator of a large-tonnage underground mine. The spill on the floor has been cleaned up according to the Federal Environmental Protection Service manual and the capacitor was placed with the spill material for disposal. The Environmental Protection Service was notified.

On December 2 a miner was injured when he was apparently hit on the head by a piece of loose ground in a cut-and-fill stope at an underground mine on Vancouver Island. The injured man suffered loss of memory for about 10 hours so very little was learned from the investigation. There was no witness to the accident and the company could not shed any light on the incident either. In this case the only recommendation was that supervisory personnel make sure all miners be made aware of the fact that all work areas are rendered safe and declared safe before the other work commences.

On December 2 at a coal-mining operation, due to icy road conditions and lack of driving experience, a pickup truck skidded off the road coming to rest on its side. No injuries resulted from this accident.

On December 3 at a small mine where muck is hoisted up the shaft in ore cars being loaded in the cage, one empty ore car came out of the cage and fell some 75 metres down the shaft. Damage was restricted to one compartment in the vertical shaft, and consisted of a broken wall plate and two guides. Cause of the incident was the use of verbal phone communications between the hoistman and cage tender rather than the proper code of mine signals.

On December 4 in a large open-pit mill, a shift electrician changed a 25 h.p. 575-volt 3-phase electric motor. After making the necessary cable connections, he proceeded to the motor control centre to check the fuses. The test was made with the power "ON" and the multi-meter testing instrument in the continuity test mode. As a result a short circuit was created on the incoming side of the fuses, which caused the main 400-amp circuit breaker to trip out. As a result of the flashover, the electrician received flash burns to his hands, arms, and face. He was taken to hospital and detained. The manager has instituted a program of instruction for electricians to review test procedures and proper equipment use.

On December 5 at the crusher of a small gold mine, the operator received severe crush wounds to his right arm. The injuries were caused by the arm being drawn between the conveyor belt and the head pulley. The operator removed the guards to clean under the belt without stopping and locking out the conveyor. When the operator's arm was drawn into the belt he was unable to reach the pull cord.

On December 7 at a large open-pit mine, an experienced driller moved a Model RR-10S drill to a new hole position. The drill was levelled but the operator started to lower the drill steel without changing the fast-head travel valve into the "drill" position. As a result the excess downward pressure caused the machine to be jacked up by the drill steel. When the front of the machine had been lifted about 1.8 metres off the surface, it toppled onto its side. There were no personal injuries. The accident occurred because of improper operating procedures. All drill operators are to receive a refresher course in the correct method of operating such drilling equipment.

On December 8 at an open-pit mine in the pre-production stage, a miner had been working on the frozen waterline by using a propane heating unit. The water truck operator was assisting him and, prior to the accident, he brought the propane assembly to the truck, placed it inside the cab, closed both doors, and returned to assist the miner. Approximately 1 hour and 20 minutes later the water truck operator returned to the truck. As he opened the driver's door an explosion triggered by the electrical energy occurred inside the cab propelled him about 3 metres. The investigation revealed a loose regulator in the propane assemble allowing the gas to leak and accumulate above the cab floor. The injured man sustained burn injuries on the face, and both forearms and hands. Employees shall be thoroughly instructed in the proper safe handling methods of compressed gas bottles.

On December 8 at an open-pit mine in the pre-production stage, three surveyors were climbing the waste-fill bank to the primary crusher haulage road, and were caught in a snow slide. One of the crew was completely buried. The other two, only partially covered, helped their partner to extricate himself. No injuries were suffered as a result of the avalanche. Adequate snow-control equipment and an experienced avalanche forecaster shall be available on the property.

On December 8 at an open-pit copper mine, the frame of a Champion 760 grader broke about 1 metre in front of the operator's cab as the unit was reversing on a flat area. The cab dropped forward causing the operator to fall into the windshield, however, the reverse motion at the time of failure prevented the broken frame section from piercing the cab with possibly serious results.

On December 15 at an underground mine at 7.40 a.m. while making his test run, the hoistman noticed a bump on the service cage side, approximately 20 metres below the 1500 level. A shaft inspection was done immediately and a 2-metre scaling bar was found wedged between the wall plate and the catch basin. There was no damage done to either the cage or to the hoisting rope.

On December 16 an EDE 45R Drill backed into and extensively damaged a one-tonne explosives vehicle which was parked nearby at a large open-pit mine on Vancouver Island. Cause was due to the drill operator not checking the surrounding and immediate area to see if it was safe to move the drill. No injuries were caused to any persons but the explosives vehicle was badly damaged.

On December 18 at a surface coal-mining operation, two dump trucks collided due to one of the truck operators not being aware of his turn for loading. The second-in-line truck following a reasonable time moved past the first truck, and was struck while reversing by the loader of the front truck, which had then decided to move forward into position. No injuries resulted from this occurrence.

On December 19 at a surface coal-mining operation, while cleaning the surface of a grizzly of large lumps of coal, a front-end loader dislodged a piece over the side to a walkway 12 metres below. A workman had just passed through the walkway to the breaker station. No injuries or damage resulted from this incident.

On December 19 at a large open-pit mine, a lubrication service truck was run over by a large pit-haul truck. No one was injured, but the lube truck was damaged extensively. The lube truck had been dispatched to the waste-dump area where the haul truck was waiting to have its hydraulic oil level checked and re-filled, if necessary. The haul truck was parked under the dump flood lights, and in front of a large pile of waste rock. The lubrication truck was parked on the right (blind) side of the haul truck where the hydraulic oil tanks were located. After the tanks were checked the lube truck driver walked around the large truck and informed the operator, and then went back to his lube truck. Then the haul truck sounded its alarm, moved forward, then swung sharply to the right to avoid the waste pile in front. In doing so, the haul truck's rear wheels ran over the cab of the lube truck. Fortunately, the lube truck driver was not in his cab, but was working at the back-end of his truck. The accident resulted from poor judgment on the part of the operator of the large truck to ensure he was clear of the other vehicle before making his turn. It is suggested that the lube truck should have been the first vehicle to drive away, out of the blind area, and into the field of vision of the operator of the large truck. It is also recommended that traffic procedures involving large haul trucks and other vehicles be reviewed periodically with the crews.

On December 22 at a surface coal-mining operation, due to a fault in the steering mechanism on steep gradients, a dump truck lost its steering capability and hit the roadside berm before the operator could fully activate the brakes. No injuries resulted from this incident.

PROSECUTIONS

1975

Four prosecutions were instituted under the *Mines Regulation Act* and none under the *Coal Mines Regulation Act*.

On May 23, 1975, a miner at the Sullivan mine of Cominco Ltd. was charged with failure to comply with Section 23, Rule 82, which states:

> "Where possible, no connection between mine workings shall be made until a thorough examination of the working toward which the active heading is advancing has been made and has shown that the work can be proceeded with in a safe manner, and the point of connection shall be guarded as an entry when blasting within fifteen feet of breaking through."

In that it was considered such an entry had not been adequately guarded. The case was held in Kimberley on December 3, 1975, and was dismissed on the grounds that the evidence was hearsay, and was ascertained too long after the fact.

On May 23, 1975, a shiftboss at the Sullivan mine of Cominco Ltd. was charged under Section 22 (4) with failure to ensure that a workman was enforcing Section 23, Rule 66 (a), which states:

> "Every blaster, before blasting, shall cause all entrances to every place where blasting is to be done, or where the safety of persons may be endangered by the blasting, to be effectively guarded so as to prevent inadvertent access thereto while a charge is being blasted."

As the same evidence was to be presented in the charge involving the miner in the preceding prosecution, which was unsuccessful, the charge against the shiftboss was dismissed.

On June 27, 1975, charges were laid against Utah Mines Ltd. and the property manager, concerning failure to comply with Section 17 (5) which states:

> "No person shall be employed in a mine unless the manager or authorized representative has assured himself that the person is either under the close personal supervision of an authorized person or has been adequately trained in the job to which he is assigned."

And Section 23, Rule 314, which states:

> "All disconnectors that control apparatus shall be locked and tagged by each person working on the apparatus to prevent inadvertent closing while work is being done on the apparatus."

These charges were laid subsequent to the investigation into the electrocution of an employee who was working on a power shovel. The case was heard in Port Hardy, November 3 and 4, 1975, at which time both charges were dismissed by the judge, who ruled that workman had been trained and that the prosecution failed to prove that the manager had not taken all necessary and reasonable measures to enforce Rule 314.

1976

Although two prosecution charges were initiated under the *Mines Regulation Act,* related to the abandonment of explosives by two different operators the cases never came to court on advice from the Attorney General's Department.

1977

No prosecutions.

1978

There was one prosecution for blasting without holding a valid blaster's certificate under Section 23, Rule 52 of the *Mines Regulation Act.* The fine was $100.

1979

No prosecutions.

1980

There were two prosecutions in 1980 in connection with one incident of unlawfully storing explosives in contravention of Section 23, Rule 22 and 24 (a) (i). The company pleaded guilty on three charges and was fined $700. The charges against the manager were withdrawn.

BLASTING CERTIFICATE SUSPENSIONS

1975

There were nine blasting certificate suspensions issued for periods ranging from one to two months. Five of the suspensions were issued for collaring and drilling holes within 6 inches of the sockets of holes which had been blasted. Suspensions were issued for not properly guarding and clearing persons from a blasting area, for performing a dangerous act with explosives, for failing to carry explosives signs on an explosive vehicle, and for having the engine of an explosives vehicle running while explosives loading was being done.

1976

Five blasting certificate suspensions were awarded for violations of blasting procedures as are contained in the *Mines Regulation Act*. The suspensions which varied from one to four months were issued for failure to properly guard a blasting area, for careless handling and use of explosives and for drilling within 15 centimetres of a hole into which explosives had been charged and blasted.

1977

Three blasting certificate suspensions were given for violations of blasting procedures as are contained in the *Mines Regulation Act*. Two suspensions of 30 and 90 days were for failure to guard adequately and the third of 60 days for drilling in a bootleg.

1978

Two blasting certificate suspensions were issued for violations of blasting procedure provisions, as contained in the *Mines Regulation Act*.

On January 12th an underground miner had his blasting certificate suspended for a three-month period for failure to guard a blast.

On January 19th an underground miner was found to have drilled two new holes within 56 centimetres and 81 centimetres of a hole which contained explosives from the previous blast. The miner had also drilled another two holes within 7.62 centimetres and 13 centimetres of previous sockets or bootlegs. His blasting certificate was suspended for a period of two months.

1979

There were eight suspensions of blasting certificates varying in length from 3 weeks to 3 months. The reasons for the suspensions were improperly examining and drilling bootlegs, improper guarding and inadequate warning.

1980

There were seven suspensions of blasting certificates (one of them a second offence within a few months), varying in length from 3 weeks to 4 months. The reasons for the suspensions were improperly examining and handling bootlegs, improper guarding and carrying caps and explosives together.

OTHER SUSPENSIONS

There were no suspensions of other certificates in the period.

MECHANICAL-ELECTRICAL, 1975–1980

There were significant advances in technology in both the mechanical and electrical fields of mining during this period. The Mining Inspection Branch of the Ministry, in conjunction with industry, played an important part in ensuring that these advances were introduced into British Columbia with due attention to the safety of all personnel in the industry. In some cases Branch members attained an international reputation in specific areas.

Examples of the contributions made in these fields are given below.

MECHANICAL

A. Diesel Equipment — Underground

The potential fire hazard of trackless diesel-powered equipment used underground is significant, particularly in coal mines.

The potential hazards arise from:

(a) the fuel;
(b) flammable fluids used in the hydraulic systems;
(c) the high surface temperatures on the engine exhausts and generally in the engine compartment.

Fire Resistant Fluids

Trackless underground equipment such as load-haul-dump machines, drilling jumbos, tractors, utility vehicles, etc., must use an acceptable approved fire resistant hydraulic fluid, i.e., one of those certified by the Canadian Explosive Atmospheres Laboratory. Steady progress was made during the period in converting to the exclusive use of these less hazardous fluids underground. Other jurisdictions have not made it mandatory as British Columbia did, effective January 1, 1975. However, the realization by industry of the significance of the proposal has gone a long way to its attainment and British Columbia presently has representation on a CSA committee currently formulating a Canadian standard.

Fire Suppression Kits

Progress has also been made in equipping vehicles used both underground and on the surface with fire suppression kits which are automatically actuated upon an outbreak of fire or a substantial temperature increase. They usually consist of a central supply reservoir, containing the extinguishing agent, together with a system of hoses and nozzles which carry the extinguishing agent to key points on the engine and hydraulic system. In addition to the automatic operation, manual actuators usually one inside the cab and one outside the vehicle, can be used when necessary.

Flameproof Equipment

Vehicles and other equipment requiring flameproof systems, have to be tested and certified by the Canadian Explosive Atmospheres Laboratory, a part of Energy, Mines and Resources Canada, for use in gassy underground mines prior to their acceptance by the Inspection and Engineering Branch.

B. Roll-Over Protective Structures

By regulation, roll-over protective structures are required on all vehicles, with very few exceptions, for underground or surface use. The use of seat belts is mandatory on such vehicles.

C. Hoisting

Periodic non-destructive testing of mine hoists is carried out together with destructive and non-destructive testing of hoisting cables and this has led in many instances to rope life extensions being granted by the Chief Inspector.

D. Safety Program on Off-Highway Trucks

As a result of an on-site brake testing program and the presentation of several papers, the Branch obtained international recognition in this field. Many tests on different manufacturer's vehicles have been conducted on 8–10 per cent downgrades. One of the early problems encountered was "brake fade" due to excessively high drum, disc, and brake lining temperatures.

Early in 1977 new minimum performance standards for truck service braking was formulated and subsequently all trucks entering service at mines and quarries in British Columbia had to qualify by meeting these standards. Follow-up includes an annual brake testing program which has resulted in a substantial improvement in brake performance due to improvements in the general braking systems. In addition to brake performance many other vehicle systems, notably steering, have to be of the highest calibre in order to gain acceptance for use.

Emergency Steering

Automatically actuated emergency steering is a requirement for all vehicles operating at mines and quarries in the Province and certification to the Society of Automotive Engineers Recommended Practice J53 is required prior to the vehicle's introduction to a mine.

E. Front Wheel Spindles on Large Dump Trucks

A number of fatigue cracks were discovered in the front wheel spindles of large trucks operating in the Province. This required the issue of instructions to all users of large vehicles to institute regular non-destructive testing of all front wheel spindles on trucks having a G.V.W. in excess of 200,000 pounds in order that immediate replacements could be made to faulty components.

F. Other Activities of the Branch

In addition to the previously mentioned work, papers were presented by various members of the mechanical/electrical staff on various topics including the steering and braking capabilities, and testing of large vehicles. Members of the Branch were active in serving on technical committees of the Canadian Standards Association relating to diesel-powered equipment for underground coal mines and fire resistant fluids for use in underground mines.

G. Equipment in Use in British Columbia

A summary of the major mechanical equipment in use in British Columbia at the end of 1980 is included as Appendix A.

SYNOPSIS OF MAJOR MECHANICAL EQUIPMENT IN USE AT MINES IN BRITISH COLUMBIA DURING 1980

1. SURFACE EQUIPMENT

A. Haulage Trucks

Capacity (tonnes)	0–20	21–40	41–75	76–100	101–150	151–175	176–200	201–300	300 +	Total
	Number of Units									
Open Pit—Coal and Metal	97	50	22	184	83	80	22	11	1	550
Gravel and Industrial	224	161	15	17						417
Underground Mines	75	35								110
Totals	396	246	37	201	83	80	22	11	1	1077

B. Rotary Drills

Size of Drill (mm)	0–80	81–160	160–205	206–255	256–305	305 +	Total
	Number of Units						
Open Pit—Coal and Metal	8	10	2	37	10	6	73
Gravel—Industrial		2		4			6
Totals	8	12	2	41	10	6	79

C. Mobile Cranes

Lifting Capacity (tonnes)	0–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	80 +	Total
	Number of Units									
Open Pit—Coal and Metal	14	21	14	16	11	2	2	4	10	94
Gravel and Industrial	3	3		1						7
Underground Mines	8	3	2	3	3					19
Totals	25	27	16	20	14	2	2	4	10	120

D. Front End Loaders

Bucket Size (m^3)	0–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–12.0	12.0 +	Total
	Number of Units							
Open Pit—Coal and Metal	39	42	17	13	15	3	4	133
Gravel—Industrial	71	159	47	8	6	2		293
Underground Mines	27	31	1		2			61
Totals	137	232	65	21	23	5	4	487

E. Mining Shovels

Shovel Size (m^3)	0–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–12.0	12.1–15.0	15.1–20.0	20.0 +	Total
	Number of Units									
Open Pit—Coal and Metal	1	2	7	18	13	25	8	8	2	84
Gravel—Industrial	4	2	2			2				10
Underground Mines		1								1
Totals	5	5	9	18	13	27	8	8	2	95

F. Other Equipment Over 5000 kg

Type	Dozers	Graders	Scrapers	Draglines	Other*	Total
	Number of Units					
Open Pit—Coal and Metal	233	79	55	1 (46 m³)	246	614
Gravel—Industrial	70	22	10	1 (3 m³)	61	164
Underground Mines	42	16	1	1 (.33 m³)	32	92
Totals	345	117	66	3	339	870

* "Other" includes: Service vehicles, backhoes, sand and water trucks, compacters, screening plants, forklifts, compressors, generators, etc.

2. UNDERGROUND EQUIPMENT

A. Diesel Powered Underground Equipment

Load-Haul-Dump	96
Front End Loaders	5
Haul Trucks	35
Locomotives	18
Drill Jumbos	38
Graders	7
Dozers	4
Others*	68
Total Diesel Powered	271

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* Others includes: Personnel carriers, service vehicles, forklifts, compressors, welders, etc.

B. Hoists

Make	**kW**	**Rope Diameter**
Bertram	634	1⅜"
Vulcan Iron Works	373	1"
C-I-R	112	⅞"
C-I-R	149	1"
Marquette		⅝"
C-I-R		⅝"
C-I-R	150	1"
Nordberg	186.5	1⅛"
C-I-R	37.3	⅝"
C-I-R	200	1⅛"
Nordberg	250	1¼"
C-I-R	149.14	¾"

ELECTRICAL

Electrical consumption in the industry remained relatively constant over the 6-year period with annual fluctuations resulting in an overall increase of approximately 8 per cent between 1975 and 1980 showing up in the metal and industrial operations and a drop being reported in the coal mines (see Appendix B). The grand total consumption in 1980 was 2,732,301,318 kWh compared to 347,900,439 in 1962.

A breakdown of the sources and uses of this power in 1980 is shown in Appendix C.

Branch Activities

Electrical engineering and inspection work increased with the expansion of mining activity. There were a large number of proposed expansions and new mining facilities as well as inspection of installed equipment.

The Branch continued its representation on the committee responsible for updating Part V of the Canadian Electrical Code pertaining to the Use of Electricity in Mines.

Polychlorinated biphenyls (PCB's) used in electrical transformers and capacitors were declared to be dangerous toxic chemicals. Much effort was expended reviewing the extent of their use and formulating emergency plans in the event of spillage, for protection of persons required to work with the spill, and for the disposal of contaminated material.

Levels of illumination for the mining industry also received considerable study with a view to improving safety conditions. A C.S.A. standard for mine lighting is the eventual goal.

In spite of the mandatory requirements of the mining acts of B.C., the *Workers Compensation Act* and C.S.A. Codes, the improper "locking out" of electrical equipment is still causing a significant number of accidents each year. These appear to be due to the increased sophistication of the equipment, improper training and human error. There is a great need for very close liaison between electrical and mechanical personnel in respect to the daily application of all lock-out procedures.

Considerable improvement has been made in large electrically powered excavating equipment in the past few years. Much of this equipment is manufactured in the U.S. where the safety codes differ from those in Canada.

Improved electrical standards for systems supplying dewatering pumps and auxiliary power in open pit operations have been introduced with the cooperation of the industry.

Metalliferous Mines

The following table shows the kilovolt ampere capacity of the company-owned generating plants at metalliferous mines and the approximate power generated in 1980.

Prime Mover	Generator Capacity kVA	Units Generated kW hours
Diesel	41,073	
Hydro	13,120	84,240,355
Steam	*nil*	*nil*

The electric power purchased from public utilities and from the generating division of Cominco Ltd., totalled 2,275,059,704 kW hours, giving a total consumption of 2,359,300,059 kW hours.

An analysis of the connected load at operating mines was as follows:

Equipment	Power (kW)
Hoists and Trams	2,349
Scraper Hoists	5,218
Electric Shovels	29,784
Electric Drills	7,081
Fans	11,983
Pumps	8,183
Rectifiers	2,380
M.G. Sets	3,918
Air Compressors	18,274
Sink-Float Plant	1,942
Crushing	24,121
Grinding	191,835
Concentrating	49,468
Magnetic Separator	97
Conveyors	23,810
Mill Pumps	51,828
Fresh Water Pumps	118,414
Workshops	7,201
Miscellaneous	25,391
Total	583,277

Structural Material and Industrial Mineral

In 1980, electric power was used at 76 structural material and industrial mineral mines and quarries. Electricity was generated by company-owned plants at 29 operations. The capacity of company-owned plants and the total power generated and purchased was as follows:

Generator Capacity (kVA)		26,904
Power Generated (kW hours)	63,950,363	
Power Purchased (kW hours)	31,104,127	
Total	95,054,490	

An analysis of the connected load is as follows:

Equipment	Power (kW)
Hoists and Trams	876
Fans	656
Pumps	2,668
Air Compressors	616
Drying Plant	2,294
Crushing	10,584
Conveyors	17,533
Milling	2,568
Screening	2,064
Workshops	678
Miscellaneous	4,663
Total	45,200

Coal Mines

Purchased power for the operation of coal properties during 1980 was 277,946,769 kW hours.

The distribution of the connected load was as follows:

Equipment	Power (kW)
Underground:	
Hoists	18
Ventilation	798
Pumping	2,356
Air Compressors	317
Continuous Miners	2,316
Shuttle Cars	555
Conveyors	1,018
Miscellaneous	149
Surface:	
Dragline	6,490
Ventilation and Drying	4,405
Air Compressors	2,614
Electric Shovels	17,851
Electric Drills	1,402
Conveyors	9,461
Hoisting	19
Haulage	1,641
Coal Breaker	977
Washing and Screening	6,558
Pumping	24,702
Coke Production	1,040
Miscellaneous	13,223
Total	97,910

ACTUAL CONSUMPTION OF POWER (IN KILOWATT HOURS)

Year	Metal Mines	Industrial Minerals	Total	Coal	Grand Total
1962	324,638,348	23,262,091			347,900,439
1963	345,296,000	23,321,875			368,677,875
1964	373,279,423	26,480,100	399,739,523	31,160,152	430,899,675
1965	467,654,500	32,010,923	499,665,423	40,915,890	540,581,313
1966	573,345,458	35,081,797	608,427,255	22,503,551	630,930,806
1967	660,924,689	31,719,975	692,644,664	22,730,640	715,375,304
1968	730,193,710	37,978,960	768,172,660	26,690,100	794,862,770
1969	809,729,000	37,675,440	847,404,440	36,658,450	884,062,890
1970	1,010,755,603	47,274,704	1,058,030,307	96,430,894	1,154,461,201
1971	1,037,369,400	49,458,734	1,086,828,134	132,404,350	1,219,232,514
1972	1,824,145,302	67,882,738	1,892,028,040	205,104,600	2,097,132,640
1973	2,264,782,712	61,781,214	2,326,563,925	219,886,220	2,546,430,146
1974	2,171,481,778	67,840,611	2,239,322,389	346,353,466	2,585,675,855
1975	2,092,083,218	66,776,611	2,158,859,748	363,274,680	2,522,134,348
1976	2,125,767,563	80,939,619	2,206,727,182	211,196,086	2,417,923,268
1977	2,212,107,802	78,731,192	2,290,838,994	311,969,368	2,602,808,362
1978	2,057,906,780	67,954,955	2,125,861,735	289,241,137	2,415,102,872
1979	2,257,447,395	88,751,855	2,346,199,250	299,880,031	2,646,079,281
1980	2,359,300,059	95,054,490	2,454,354,549	277,946,769	2,732,301,318

ENVIRONMENTAL CONTROL

PREFACE

The Ministry of Energy, Mines and Petroleum Resources, Environmental Control Inspectors conduct inspection surveys for dust, asbestos fibre, ventilation, radon daughters, gases and noise at metal, coal and industrial minerals mines and quarries throughout the Province of British Columbia. The inspection surveys include siliceous dust control sampling by means of Konimetry, coal dust sampling performed gravimetrically, asbestos fibre sampling, ventilation air movements, hazardous gases sampling, ionizing radiation sampling, noise level surveys, hearing conservation programs, ensuring that "dust exposure" occupations maintain valid certificates of fitness, ensuring that audiometric tests for hearing acuity are maintained, training audiometric technicians and training dust control technicians.

The present permanent staff establishment for the Environmental Control Section consists of: Senior Inspector, two Inspectors on dust control, ventilation and related hazards, an Inspector Technician on noise control surveys and an Inspector Audiologist on hearing conservation programs.

During the period under review there were a large number of staff changes with the result that in some years there was an entirely inadequate number of inspections made. In spite of this, through the cooperation of a major segment of the industry, significant progress has been made in improving the environmental conditions in the mines in the Province. Most notable advances have been made in the following areas.

1. Ear protection.
2. Integral mufflers and drills.
3. Conditions in asbestos operations.

4. While progress has been made in dust control, crushing and screening operations continue to be a problem which will require the concentrated efforts of all personnel including managers, engineers, supervisors, workers and inspectors to ensure that healthy conditions are maintained at the workplace.

It is apparent that all of the environmental control standards are attainable with existing technology. The effective control, however, requires the following elements to be present.

1. The setting of realistic standards and regulations and the understanding of these by all personnel.
2. An understanding of and a dedication to maintaining healthy working conditions by all personnel involved in the operation.
3. Proper design of equipment.
4. Proper training.
5. Proper use of equipment by all operating personnel.

In some cases this may require the expenditure of capital or operating funds which may be difficult in the short term but should produce significant benefits in such costly items as health, turnover, accidents, etc.

The main problems which resulted in lack of compliance in the period were as follows.

1. Design of dust control systems in crushing plants.
2. Inadequate hood velocities and the use of compressed air for cleaning purposes in assay grinding rooms.
3. Inadequate supply of uncontaminated ventilation air at drilling faces particularly at raises and drawhole development headings where auxiliary systems are often required.
5. Dust control equipment in underground crushing plants requires proper design and maintenance.
6. Crushing and screening plants at limestone and rock quarries and other open pit operations were frequently above allowable dust levels, partly due to the use of portable plants with inadequate protection.
7. In the period the test for asbestos fibres was changed from the Midget Impinger to the Membrane Filter method. For a while the results of the tests conducted were poor but improvements were made and at the end of the period were significantly better. The standard was tightened up on January 1, 1980 and renovations were underway to ensure that all areas of the plant would meet the new conditions.
8. In drilling operations at open-pit mines lack of maintenance and failure to comply with known preventive methods has resulted in lower than possible performance.
9. The acquisition of time integrating noise measurement equipment in 1980 is leading to more accurate estimates of total daily noise exposure and could lead to some revisions in the present requirements for wearing hearing protection for some occupations.

AUDIOMETRIC PROGRAMS

In 1979 and 1980 a hearing conservation program for miners was established in the Province. This included conducting, collating, and computerizing individual hearing tests, the conduct of training and refresher courses for Industrial Audiometric Technicians, the supply of audiometric data to all mines and district mining offices on a monthly basis for follow-up, the providing of information to all mines on ear protection, audiometers and test booths and provision of data of the Workers' Compensation Board on claims. In 1980, 8227 hearing tests were done, almost double the number in 1979. 11 per cent required medical attention and 9 per cent were wearing inadequate ear protection for their jobs.

The audiologist also instructs at the masters level at U.B.C. and provided consultative services to the Rossland Mining School.

Ninety-seven people hold certification as Industrial Audiometric Technicians of which seven are from the Northwest Territories or Yukon who have recognized the B.C. program as their official training program.

DUST CONTROL

The following table shows the numbers of environmental control inspections carried out each year during the period and the results obtained.

SUMMARY OF ENVIRONMENTAL CONTROL INSPECTIONS

Type of Inspection	1975			1976			1977		
	Number of Inspections	Number of Operations	Percent Meeting Standards	Number of Inspections	Number of Operations	Percent Meeting Standards	Number of Inspections	Number of Operations	Percent Meeting Standards
DUST	58	52		36	34		42	41	
U/G Mines				10	9		9	8	
Drilling			77			88			100
All other U/G operations			82			88			100
Crushing plants			79			63			60
Assay grinding rooms			95			71			58
Open Pit				5	4		9	9	
Drilling			67			75			100
All other operations			85			100			89
Crushing plants			36			83			54
Limestone and Rock Quarries				21	21		18	18	
Drilling			100						
Other Operations			100						
Crushing and screening			61[1]						
Uranium									
Asbestos			19				1	1	45
Coal Mines									
Open pit							2	2	N A
U/G			67				3	3	83
Structural and industrial minerals									
Drilling			N/A			67			100
All other						100			100
Crushing and screening						43			78
Operator's position						67			N A
NOISE[2]	N/A	N/A		29	28		7	7	
Ear protection			78			79			86
Audiometric tests			89			82			98
CERTIFICATES OF FITNESS									
Lode mines			96.2			99			98
Coal mines			98.4			N/A			99
Asbestos			100.0			N/A			98

[1] 81 per cent for operator's positions.

[2] The threshold limit value for an eight-hour day changed from 90 dbA to 85 dbA January 1, 1975.

SUMMARY OF ENVIRONMENTAL CONTROL INSPECTIONS—*Continued*

Type of Inspection	1978			1979			1980		
	Number of Inspections	Number of Operations	Percent Meeting Standards	Number of Inspections	Number of Operations	Percent Meeting Standards	Number of Inspections	Number of Operations	Percent Meeting Standards
DUST	84	66		145	104		94	85	
U/G Mines	22	20		31	22		28	25	
Drilling			82			65			84
All other U/G operations			100			93			93
Crushing plants			76			91			94
Assay grinding rooms			100			93			92
Open Pit	21	13		25	13		14	11	
Drilling			80			86			77
All other operations			100		100		100		
Crushing plants			76			67			79
Limestone and Rock Quarries	34	26		54	42		36	35	
Drilling									
Other Operations									
Crushing and screening									
Uranium	1	1	100	27	20	N/A[3]	8	7	N/A
Asbestos	1	1	96	2	1	97	2	1	96
Coal Mines									
Open pit	1	1	100	3	3	100	3	3	100
U/G	4	4	40	3	3	98	3	3	94
Structural and industrial minerals									
Drilling			91			100			100
All other			100			100			100
Crushing and screening			73			81			74
Operator's position						86			100
NOISE[2]	142	18		549	39		224	8	
Ear protection			41			74			
Audiometric tests			85			98			
CERTIFICATES OF FITNESS									
Lode mines			99			99			94
Coal mines			99			99			100
Asbestos			99			100			91

[2] The threshold limit value for an eight-hour day changed from 90 dbA to 85 dbA January 1, 1975.

[3] Two non-uranium mining operations were closed down until corrective steps were taken to lower the radon daughter concentrations.

SHIFTBOSS CERTIFICATES

Section 21 of the *Mining Regulation Act* requires that every person employed underground or in open-pit workings must be under the daily supervision of an official who is the holder of a shiftboss certificate issued under the Act. In addition, section 23 of the *Coal Mine Regulation Act* requires that every person employed in open-pit workings at a coal mine shall be under the daily supervision of a shiftboss or other official who is the holder of an open-pit shiftboss certificate issued under the Act.

An applicant for a shiftboss certificate must hold a non-restricted blasting certificate (gravel pits excluded), a mine rescue certificate (surface or underground as requisite), a currently valid first-aid certificate, and is required to pass an examination on the regulations and rules, as contained in the respective Acts. Four different certificates are issued; one for underground metal-mining operations; one that is valid in coal-mining open-pit operations, one that is valid in metal-mining open-pit operations, and a fourth for sand-, gravel- and clay-removal operations. A fee of $5 is charged for the examination and the passing grade is 65 per cent.

The Board of Examiners may grant provisional certificates on a one-time basis for a period of six months under such conditions as it considers advisable.

CERTIFICATES

Shiftboss

The following tables analyze the annual activity

	1975	1976	1977	1978	1979	1980
Applications Received	171			107	95	
Examination Written	141	126	86	82	75	
Number Passed	110	99	75	79	69	
Number of Certificates Issued	109	96	71	110	69	114

Analysis of Shiftboss Certificates Issued by Type

Underground	43	16	19	39	19	48
Open Pit	60	53	42	64	41[1]	60[1]
Gravel Pits	6	27	10	7	8	6
Provisional	86	74	71	67	54	

[1] 1979 — 16 coal, 1980 — 23 coal.

CERTIFICATES OF COMPETENCY

Sections 23 and 24 of the *Coal Mine Regulation Act* require that managers and certain other supervisory officials of underground coal mines shall be holders of certificates of competency issued under this Act. A Board of Examiners is responsible for setting examinations from time to time for these certificates, for considering applications for interchange certificates, and for advising the Minister in accordance with section 26 (3) of the Act.

The following table summarizes the issue of certificates of competency for the year.

	1975		1976		1977		1978		1979		1980	
	R	I	R	I	R	I	R	I	R	I	R	I
1st Class		1	1		2	3		1		2		3
2nd Class			1	1								
3rd Class	7		1	3	6			1	2	5		4
Provisional 3rd Class								1				

R = Regular
I = Interchange

SURVEYOR'S CERTIFICATES

There were four surveyor's certificates of competency issued during the period, all being interchange certificates. There was 1 in 1975, 2 in 1976 and 1 in 1978.

CERTIFICATION OF MINERS

Rule 316 of the *Mining Regulation Act* makes it mandatory for miners to have a miner's certificate before they can be employed at a working place in an underground mine. There are three types of certificates: a provisional, a conditional, and a permanent. A provisional certificate is issued by an authorized person at a mine to miners who are performing miner's work but who have not received a permanent or conditional certificate. A conditional certificate was issued to all experienced miners who had at least six months underground employment prior to Rule 316 being proclaimed. To acquire a permanent certificate, a miner must have three years' underground experience, hold first-aid, mine-rescue, and blasting certificates, and also pass an examination. The examination is conducted and the certificate issued by the District Inspector. By issuing a Miner's Certificate the Ministry of Energy, Mines and Petroleum Resources recognizes that a miner has acquired training and skills that will make him a better and safer miner.

BRAVERY AWARD

In the 1973 Annual Report it was recorded that Mr. James Mellon, a miner at Silmonac, had been awarded the Canadian Institute of Mining and Metallurgy's Medal for Bravery and a cash award of $1,000 from the Workers' Compensation Board for his actions in removing an injured workman from a work heading in the Silmonac Mine when holes loaded with explosives were detonating.

In 1975 Mr. Mellon received a further honour in that the Carnegie Hero Fund Commission awarded him a bronze medal and $750 in cash.

MINE RESCUE, SAFETY, AND FIRST AID

The promotion of Mine Rescue, Safety, and First Aid and providing assistance to the industry is one of the key functions of the Inspection and Engineering Branch.

MINE RESCUE

Six district mine rescue stations were fully maintained under the supervision of coordinators who are fully qualified in all aspects of first-aid and mine rescue. These districts are as follows: Fernie, Nelson, Kamloops, Nanaimo, Prince George and Smithers. Each station is established as a mobile unit to transport equipment anywhere in these areas (Fernie was made mobile in 1978) to be available for either rescue or training services, and is equipped with sufficient self-contained, oxygen-supplying, breathing equipment to maintain at least two rescue teams of six men each, should an emergency arise in the nearby mines.

In 1980, the mine rescue equipment owned by this Ministry was 59 Aerorlox three-hour liquid oxygen breathing machines, 43 Draeger BG-174 and 30 Demand thirty-minute units. The equipment owned by industry was 30 Aerorlox and 45 Draeger BG-174. Each station, as well as most mines, has additional auxiliary equipment such as Type N gas masks, self-rescuers, gas detectors, oxygen therapy units and first-aid equipment.

The district coordinators of rescue training make regular visits to the mines to give rescue training to open-pit and underground employees and to check the rescue equipment to ensure its serviceability.

Both full and refresher courses in underground, survival, gravel pit and surface mine rescue training, as well as first-aid, were presented regularly by the district coordinators at various mines and centres throughout the Province.

Back problems have long been a source of concern, discomfort and medical problems in industry. In 1979 a talk was developed to try to instruct workers and supervisors on the nature and methods of avoiding these problems.

Members of the industry showed a great deal of interest in this training as demonstrated in the following tabulation which shows the number of certificates of each class issued each year.

TABLE A

Type of Certificate	1975	1976	1977	1978	1979	1980	Totals
Mine Rescue Survival Instructor		12	4		1	11	28
Mine Rescue Survival	1,226	350	263	382	212	384	2,817
Underground Mine Rescue	157	77	129	98	82	206	749
Surface Mine Rescue Instructor		21	5	15	9	17	67
Surface Mine Rescue	328	397	413	337	275	423	2,173
Gravel Pit Rescue	7	63	31	20	34	38	193
Advanced Mine Rescue				160	6		166
Industrial First Aid	28	38	45	21	40	20	192
St. John's Ambulance First Aid	575	507	368	318	226	313	2,307
Safety Orientated First Aid		948	1,000	385	135	1,087	3,555
Totals	2,321	2,413	2,258	1,736	1,020	2,499	12,247

COMPETITIONS

This interest in mine safety and rescue work is stimulated by the various competitions held annually among all the mines in the Province.

These competitions are basically in five areas.

1. Mine Rescue—Underground.
   —Surface.
2. Underground bench competition to demonstrate maintence of safety equipment.
3. Safety competitions based on annual accident frequency rates for — Small mines (West Kootenay Mine Safety Association)—Open Pit Mines and Quarries (Ministry of Energy, Mines and Petroleum Resources—2 trophies).
4. First Aid competitions.
5. John T. Ryan Safety Trophies. Open to all Canadian mines, with one division for metal mines and one for coal mines. These trophies are awarded annually on the basis of accident frequency results. There are Regional and Canada-wide awards.

In addition the United Steelworker's Union awards a Canada Trophy for Metal Mines and a Canada Trophy for Coal Mines annually based on safety records.

The winners of each competition are tabulated below followed by a brief outline of the entry requirements for each competition.

TABLES B

MINE RESCUE COMPETITION'S WINNERS BY YEARS

Competition (year started)	1975	1976	1977	1978	1979	1980
Underground						
1. East Kootenay Mine Safety Association (1922)	Kaiser Resources. Captain: Peter Zieth	Kaiser Resources Ltd. Captain: J. Peters	Sullivan Mines of Cominco Ltd. Captain: C. Unruh	Kaiser Resources (Fernie) Captain: J. Peters	Sullivan Mines of Cominco Ltd. Captain: C. N. Carnel	Kaiser Resources Captain: J. Peters
2. West Kootenay Mine Safety Association (1946)	Kaiser Resources Captain: Harry Eberts	H. B. Mine Captain: Barry Abbott	Kaiser Resources (Sparwood) Captain: Harry Eberts	Sullivan Mines of Cominco Ltd. Captain: A. Bruemmer	Kaiser Resources Ltd. (Sparwood) Captain: Harry Eberts	Sullivan Mines of Cominco Ltd. Captain: S. Hodgson
3. Vancouver Island Mine Safety Association (1914)	Western Mines Ltd. Captain: H. Uhrig	Western Mines Ltd. Captain: H. Uhrig	Utah Mines Ltd. (Island Copper) Captain: Marv Orosz	Western Mines Ltd. Captain: H. Uhrig	1. Western Mines Ltd. Captain: H. Uhrig 2. Noranda Mines Ltd. Boss Mountain Captain: B. Buys	1. Western Mines Ltd. Captain: H. Uhrig 2. Noranda Mines Ltd. Boss Mountain Captain: G. Palm
4. Central B.C. Mine Safety Association (1948)	Granduc Mines Ltd. Captain: W. Jackson	Boss Mountain Mine of Noranda Mines Ltd. Captain: J. Howat	Western Mines Ltd. Captain: H. Uhrig	Represented by Noranda Mines Ltd. Boss Mountain in Provincial meet	Represented by Noranda Mines Ltd. Boss Mountain in Provincial meet	Represented by Noranda Mines Ltd. Boss Mountain in Provincial meet
5. Provincial Mine Rescue Competition (1956)	Kaiser Resources Captain: Peter Zeith	H. B. Mine* Captain: Barry Abbott	Western Mines Ltd.† Captain: H. Uhrig	Kaiser Resources (Fernie) Captain: J. Peters	Western Mines Ltd. Captain: H. Uhrig	Noranda Mines Boss Mountain* Captain: G. Palm

* Also won the Canadian championship.
† 2nd in Canadian championship.

MINE RESCUE COMPETITION'S WINNERS BY YEARS

Competition (year started)	1975	1976	1977	1978	1979	1980
Surface						
1. Northern Surface Mine Rescue Division	Gibraltar Mines Captain: R. Young	Wesfrob Mines Ltd. Captain: L. Campanas	Noranda Mines (Bell Copper Division) Captain: Rick Tait	Cassiar Asbestos Corp. Captain: G. Smith	Cassiar Asbestos Corp. Captain: G. Smith	Granisle Mines Captain: B. Graffe
2. Southern Surface Mine Rescue Division	Similkameen Mining Co. Ltd. Captain: L. Hornsby	Phoenix Copper Division of Granby Mining Co. Captain: H. Varabioff	Kaiser Resources Ltd. (Sparwood) Captain: Alex Gallacher	Kaiser Resources Ltd. (Sparwood) Captain: A. Gallacher	Byron Creek Collieries Captain: L. Robin	Afton Mines Captain: F. Venzi
3. Central Surface Mine Rescue Division		Brenda Mines Ltd. Captain: M. Habermehl	Utah Mines (Island Copper) Captain: Marv Drosz	Gibraltar Mines Captain: P. Beaudoin	Gibraltar Mines Captain: P. Beaudoin	Lornex Mines Captain: J. Hawkins
4. Provincial Surface Mines Rescue (1972)	Similkameen Mining Corp. Ltd. Captain: L. Hornsby	Phoenix Copper Division of Granby Mining Co. Captain: N. Varabioff	Kaiser Resources Ltd. (Sparwood) Captain: Alex Gallacher	Kaiser Resources Ltd. (Sparwood) Captain: A. Gallacher	Gibraltar Mines Captain: P. Beaudoin	Lornex Mines Captain: J. Hawkins

SAFETY COMPETITION'S WINNERS AND ACCIDENT FREQUENCY (A.F.)
(per million man-hours)

Competition (year started)	1975	1976	1977	1978	1979	1980
1. West Kootenay Mine Safety Association Trophy (small underground metal mines) (1951)	Dankoe Mines Ltd. A.F. 237	Dankoe Mines Ltd. A.F. 87	Clayburn Industries Ltd. A.F. 46	Cominco Ltd. H. B. Mine A.F. 0	Erickson Gold Mining Corp. A.F. 64.8	Gold Belt Mine A.F. 53.0
2. Energy, Mines and Petroleum Resources Trophy A (open pit mines and quarries) (1961)	1975 Joint Winners Construction Aggregates Britannia Canada Cement Lafarge Ltd. Texada Is. B.C. Cement Cobble Hill Domtar Chemicals Lime Division Texada A.F. 0	1976 Joint Winners Canada Cement Lafarge Ltd. Vananda Cobble Hill Quarries (B.C. Cement Ltd.) Cobble Hill Hillside-Furry Creek (Construction Aggregates Ltd.) Port Mellon Ideal Basic Industries Ltd. Vananda Imperial Limestone Ltd. Vananda Jack Crewe Ltd. Port Coquitlam Surrey Pit (Lafarge Concrete) Surrey A.F. 0	1977 Joint Winners Canada Cement Lafarge Ltd. Vananda Domtar Chemicals Ltd. (Lime Division) Blubber Bay Ideal Basic Industries Vananda A.F. 0	1978 Joint Winners Canada Cement Lafarge Ltd. Vananda B.C. Cement Co. Ltd. Cobble Hill Ideal Basic Industries Ltd. Vananda A.F. 0	1979 Joint Winners Argus Aggregates Ltd. C.R. Aggregates Sales, Watts Point Quarry Canada Cement Lafarge Ltd. Vananda Domtar Chemicals Ltd. Ideal Basic Industries Ltd. Vananda A.F. 0	1980 Joint Winners B.C. Coal (Greenhills) Canada Cement Lafarge Ltd. Vananda Domtar Chemicals (Lime Division) Blubber Bay Construction Aggregates Ltd. Producers Pit A.F. 0
3. Energy, Mines and Petroleum Resources Trophy B (open-pit mines and quarries) (1965)	Phoenix Copper Mine Granby Mines Ltd. A.F. 0	Westfrob Mines Ltd. A.F. 10.78	Afton Mines Ltd. A.F. 3.61	Afton Mines Ltd. A.F. 9.43	Cassiar Asbestos Ltd. A.F. 8.47	Cassiar Resources Ltd. A.F. 11.77

PROVINCIAL UNDERGROUND BENCH COMPETITION

Year Started	1978	1979	1980
1978	Noranda Mines Ltd. Boss Mountain Captain: B. Buys	Noranda Mines Ltd. Boss Mountain Captain: B. Buys	Noranda Mines Ltd. Boss Mountain Captain: G. Palm

WINNERS THREE PERSON MINERS FIRST AID COMPETITION

Competition	1975	1976	1977	1978	1979	1980
Northern Division	Granisle Copper Ltd. Noranda Mines	Granisle Copper Ltd. Noranda Mines Captain: Charles Platt	Endako Mines Captain: Nick Marceniuk	Granisle Copper Ltd. Noranda Mines Captain: C. Pratt	Granisle Copper Ltd. Noranda Mines Captain: D. Campbell	Granisle Copper Ltd. Noranda Mines Captain: D. Campbell
Central Division	Brenda Mines Captain: Adam Schmidt	Bethlehem Copper Corp. Captain: Gordon Lowe	Brenda Mines Captain: Adam Schmidt	Brenda Mines Captain: Adam Schmidt		Gibraltar Mines Captain: B. Weenk
Southern Division		Granby Mining Captain: John Kazakoff	Similkameen Mines Captain: J. Cunliffe	Similkameen Mines Captain: B. Gilman		Similkameen Mines Captain: D. Mullin
Vancouver Island Association	Western Mines Captain: H. Uhrig	Texada Mines Captain: R. Brow	Gibraltar Mines Captain: D. Fossen	Western Mines Captain: T. LaBarron	Western Mines Captain: T. LaBarron	Western Mines Captain: T. LaBarron
E. Kootenay Association				Sullivan Mines Cominco Captain: N. Hamilton	Sullivan Mines Cominco Captain: N. Hamilton	Sullivan Mines Cominco Captain: N. Hamilton
W. Kootenay Association*	H. B. Mine Cominco Captain: Wayne Osborne	H. B. Mine Cominco Captain: Wayne Osborne	Similkameen Mines Captain: J. Cunliffe	H. B. Mines Cominco Captain: Willard Taylor	No competition	Gold Belt Mine Captain: T. Gresiuk
Central Association		Teck Corp. Beaverdale Captain: J. Bandesen	Teck Corp. Beaverdale Captain: J. Bandesen	Wesfrob Mine Captain: M. Pennock	Lornex Mining Corp. Captain: G. Collison	Boss Mountain Noranda Mines Captain: E. Rudolph
Provincial (started 1978)				H. B. Mine Cominco Captain: Willard Taylor	Lornex Mining Corp. Captain: G. Collison	Similkameen Mines Captain: C. Mullin

* Note: The H. B. Mines team was coached from 1973–78 by Mrs. K. Lofstrom and won the trophy every year except 1977.

MINE RESCUE

Four mine safety associations, sponsored by the Ministry of Energy, Mines and Petroleum Resources and the Workers' Compensation Board, continued to operate in different areas in the Province. They were aided by mining company officials, safety supervisors, inspectors of mines, mine rescue co-ordinators, and, in some areas, local industry. Each association promotes mine rescue and first-aid training, in addition to safety education in their various districts for underground operations.

The four associations are Vancouver Island, East Kootenay, West Kootenay and Central British Columbia.

Each association sponsors annual competitions between mines in the district for underground rescue. The four winners from the districts compete for the Provincial championship in their event. The winner of the underground competition goes on to compete in the Canadian competition. These is no Canadian surface mine competition.

The First-Aid Team competition and, since 1978, the Underground Bench competitions are held at the same time.

Surface mines are covered by these Divisions, Northern, Central and Southern, which are similarly sponsored, hold similar annual competitions and promote safety in their respective areas.

UNDERGROUND BENCH COMPETITION

In 1978 the Provincial Underground Bench Competition was instituted in which the teams competing had to demonstrate their proficiency in the examination and testing of their apparatus prior to use. This event was in memory of the late B. Abbott, captain of the Cominco Ltd., H.B. Mine Rescue team of 1976, and the winner of the Canadian Mine Rescue Competition of the same year.

SAFETY COMPETITIONS—WEST KOOTENAY MINE SAFETY ASSOCIATION TROPHY (For Small Mines)

In 1951 the West Kootenay Mine Safety Association donated a safety trophy for annual competition in order to encourage and promote safety in small mines. Entrants were originally restricted to the West Kootenay area, but in 1956 this restriction was removed and entries are accepted from any qualifying mine in the Province.

The award is made to the metal mine having the lowest compensable accident rate and having worked a total of from 2,500 to 30,000 shifts per year, at least one-third of which were worked underground.

SAFETY COMPETITIONS, OPEN-PIT MINES AND QUARRIES

In 1961 the Ministry of Mines and Petroleum Resources organized a safety competition for the open-pit and quarry industry and instituted awards and donated a trophy for annual competition for operations having the least number of compensable accidents during the year. In 1965, in order to provide a more equitable competition basis, it was decided to donate a second trophy and to divide the entrants having a large number of man-hours into two groups; the A group, for those operations having from 35,000 to 200,000 man-hours per year; and the B group, for those having in excess of 200,000 man-hours per year. In addition, since 1977 a Certificate of Achievement has been awarded to operations amassing 15,000 man-hours without accidents over any continuous time interval not previously used to obtain an award.

FIRST AID COMPETITIONS

First Aid Competitions were initiated in the mining industry based on a 5-man team but by 1976 it was evident that, while the 5-man first aid competitions had certainly assisted in expanding and improving first aid training in this Province, the frequency with which a team of five fully-trained individuals might be present at the scene of an accident was very low. In 1969 the West Kootenay Association started a 3-man competition and this idea spread throughout the other associations both underground and surface, so that by 1976, a three-person miners' first-aid team which required one of the team members to be the patient had become the competitive standard. At that time it was also suggested that the St. John Standard course be adopted as the training standard and only those who were working in or about a mine be permitted to enter in the competition. In 1976, a total of 26 teams entered the various district competitions. The first Provincial Three-Persons' Miners' First-Aid event was held in Nanaimo on June 1978.

JOHN T. RYAN TROPHIES

The John T. Ryan safety trophies were established in 1941 by The Mine Safety Appliance Company of Canada Limited to promote safety in metalliferous and coal mines in Canada. The administration of these annual awards is conducted by the Canadian Institute of Mining.

There have been a number of changes in the regulations and qualifications over the years so that now there are three categories open for annual competition.

1. Metalliferous underground mines for which there is a Canadian trophy and four regional trophies. B.C. Mines compete in the B.C. and Yukon Region.
2. Select mines which include open-pit and strip mines for any mineral including coal. There is a Canadian trophy and two regional trophies. B.C. Select Mines compete in the Western Region including all Canada west of the Manitoba-Ontario border.
3. Coal mines, which are restricted to underground mines. There is just a Canada trophy in this category.

Applications for these awards are submitted annually through the Chief Inspector of Mines. They are awarded to the company or companies having the least number of compensable accidents in a continuous period in which 500,000 man-hours (120,000 for underground coal mines) of employment are recorded. If the 500,000 man-hours cannot be achieved in one year, they may be accumulated over a longer continuous time period but the complete calendar year must be included. No portion of that period may be used in another application for the same award but may be used in application for a higher award. A fatality causes automatic disqualification for the period in which it occurs.

British Columbia mines and companies winning John T. Ryan Trophies during period were as follows:

Canada Trophies

1975—Michel Collieries of Kaiser Resources Ltd. for the Underground Coal category.

Regional Trophies—Metalliferous Mines—British Columbia and Yukon

1975—Granduc Mine—Granduc Operating Co.
1977—H. B. Mine—Cominco Ltd.—Salmo.
1980—Wesfrob Mining Division—Falconbridge Nickel Mines Ltd.

Regional Trophies—Select Mines—Western Region

1976—Phoenix Copper Mine—Granby Mining Co. (4.76).

RECLAMATION

Reclamation is administered by the Inspection and Engineering Branch under the authority of section 10 of the *Mining Regulation Act* and section 9 of the *Coal Mine Regulation Act*. The objective is to restore lands used in mining, and coal and mineral exploration to a useful purpose compatible with the surrounding countryside. Reclamation requirements do not apply to land disturbed prior to legislation in April 1969.

Reclamation permits are issued by the Minister for coal mines, metal mines and coal exploration. The Chief Inspector of Mines issues reclamation permits for mineral exploration, gravel pits, quarries and placer mining.

During 1978 Reclamation permits were altered from the previous three-year term to a permanent basis. Administrative control is maintained through annual reclamation reports or annual notices of work.

During the period reclamation activity in the field increased significantly. For example, by 1977 a total of 414 permits had been issued involving disturbance of 17,140 hectares and bonding of $4,475,390.00; 2,740 hectares had been reclaimed. By 1980 the total disturbance had risen to 20,448 hectares, of which 4,519 or 22 per cent had been reclaimed.

This achievement was due in no small measure to the activities of the Inspection and Engineering Branch which in concert with Industry stimulated research, education and dialogue.

In 1976 the "Guidelines for Coal and Mineral Exploration" was published and established standards for environmental protection and reclamation of exploration activities. A Tailings Reclamation Research Program was initiated in conjunction with Industry and Dr. Lavkulich, Professor of Soil Science at U.B.C. The Afton open-pit copper mine and smelter in Kamloops proposed raising beef cattle on the minesite from hay fields developed on salvaged topsoil. This operation is proving that a major mine and smelter can co-exist with a cattle ranching operation.

In 1977 several research programs were conducted resulting in the publication of a number of reports.

Ministry of Mines and Petroleum Resources Reclamation Program, Northeast Coal Block 1977 (Published in 1978).

Revegetation of Disturbances in the Northeast Coal Block, Current Activities and State-of-the-Art 1977 (Published in 1978).

The first annual Reclamation Symposium sponsored by the Technical and Research Committee on Reclamation and the Ministry of Mines and Petroleum Resources was held. It provided a forum for members of industry, government and the academic community to exchange views and ideas. The first annual Mine Reclamation Award was presented to Kaiser Resources Ltd. with the Bull River Mine of Placid Oil Ltd. receiving a citation.

In 1978 the following additional reports were published:

Reclamation of Lands Disturbed by Mining. Proceedings of the Second Annual British Columbia Mine Reclamation Symposium.

Handbook of Environmental Protection and Reclamation in Coal Exploration (draft).

Reclamation of Abandoned Mine Spoils in British Columbia, 1977–1978.

The second annual Mine Reclamation Symposium was held with 162 participants. The Reclamation Award was presented to the Reclamation Research Dept. of Cominco Ltd. for its outstanding contribution to mine reclamation research. Citations were presented to Elco Mining and Kaiser Resources Ltd.

Under an accelerated mineral development program the Branch revegetated old mine waste disposal areas at Princeton, Salmo, Phoenix Copper and Hedley.

In 1979 vegetation studies continued at the operating mines. The results were computerized and published for the benefit of the industry. The vegetation studies on abandoned tailings ponds were continued with the results ranging from excellent to poor.

The Third Annual Reclamation Symposium sponsored by the Ministry and the Mining Association of B.C. was again successful with 190 participants. The Reclamation Award was made to Kaiser Resources Ltd. for its excellent program and research work. Citations were awarded to Craigmont Mines Ltd. at Merritt and Fording Coal Limited at Elkford.

In 1980 the Fourth Annual Reclamation Symposium was again held under the same sponsorship with 190 participants. The Reclamation Award was presented to Fording Coal Limited for their development and application of conservation and reclamation technology designed to protect and rehabilitate land and watercourses within the Fording Valley. Citations went to British Petroleum Explorations (Canada) Ltd. at Sukunka; Utah Mines Ltd.—Island Copper Mine at Port Hardy; and Kaiser Resources Ltd. at Sparwood. Honourable mention was given to Ranger Oil (Canada) Ltd., Silver Standard Mines, Newmont Mines Ltd. and Byron Creek Collieries Ltd.

MINING AND FOSSIL FUEL ROADS AND TRAILS

Under the authority of the *Ministry of Energy, Mines and Petroleum Resources Act*, the Ministry conducts a Roads Assistance Program the object of which is to encourage and assist in the development of mineral and fossil fuel resources in the Province.

Requests for assistance must be made to the Ministry, on an application form provided by the Ministry, before the commencement of work.

The principle undertakings in the period were as follows:

1975

Twenty-two applications were received but no assistance was granted. Exploration was down this year.

There was no new construction on the Omineca Road but there was considerable upgrading and the bridge at Germansen Landing was completed. The maintenance program was continued. The total cost was nearly $260,800.

1976

Twenty-five applications were received and assistance was granted to 17.

An all-weather road was built from Dawson Creek to the Babcock Coal area in the northeast coal study area at a cost of $400,000.

$392,000 was expended maintaining, upgrading, and extending the Omineca Road near Moosevale Creek and Tsayta Lake with studies being conducted to Takla Landing.

1977

Grants totalling $113,000 were awarded to build or upgrade access roads to mineral and petroleum development areas.

In addition $170,000 was spent on the Takla Landing area building a new road and $374,200 was used for construction and maintenance on other parts of the Omineca Road system.

This year $100,000 was devoted to building and up-grading airstrips in northern British Columbia to assist mineral and fossil fuel development where ground access is very expensive or could cause major damage to the environment.

1978

$600,000 was used to provide an all-weather access road to fossil fuel areas east of Fort Nelson and $300,000 was spent on engineering studies and designs for access to the area between the Lower Pine and the Moberly Rivers.

A further $230,000 was spent on airport construction and upgrading at Kutcho Creek and Sturdee River.

$500,000 was spent on the Omineca Road including work on reclamation and environmental studies.

An additional $200,000 was used to improve 25 smaller projects involving exploration access roads.

1979

$475,000 covered the extension of the all-weather road east of Fort Nelson, the construction of a bridge across the Snake River and a 2-kilometre by-pass road around an Indian reservation.

$215,000 was spent on the Omineca Road including a new bridge across Lay Creek.

$116,000 was granted to 15 smaller projects.

1980

$2 million was used to develop the Sierra-Yoyo Road.

$340,000 was used in the further maintenance and development of the Omineca Road.

$100,000 was granted on 9 shared-cost projects.

AID TO THE SUPERINTENDENT OF BROKERS

A. R. C. James, Senior Inspector of Mines, continued to act as mining engineer adviser to the Superintendent of Brokers' Office until his retirement in March 1978. His duties were mainly to advise the Superintendent and his staff in regard to engineering reports submitted in support of prospectuses by mining companies as required by Regulation 167 under the *Securities Act*. Engineering advice was also required from time to time by the Superintendent on certain other matters. Valued assistance to the Superintendent in the evaluation of reports on petroleum and natural gas properties was given by W. M. Young, Chief of the Geology Division of the Petroleum and Natural Gas Branch.

PROSPECTOR'S ASSISTANCE, 1975–1980

Financial assistance to prospectors has been available since 1943 under the *Prospector's Grub-Stake Act*. In 1974 this Act was repealed and the *Prospector's Assistance Act* was passed which significantly improved the benefits available to prospectors and established a system of training courses conducted throughout the Province for persons wishing to qualify for prospector's assistance.

It can be seen from the table below this program which, since 1976, has been administered by the Geological Branch of the Mineral Resources Division, was consistently well received.

Year	Total No. Granted	Returned	Net No. Recipients	Total Payment	Average Payment
1975	190	28	162	$218,700	$1,350
1976	75	3	72	124,150	1,724
1977	122	4	118	176,500	1,496
1978	193	13	180	313,500	1,742
1979	167	5	162	215,000	1,327
1980	156	3	153	217,250	1,420

MINERAL DEVELOPMENT COMMITTEE

In 1976 a mineral development committee was formed to oversee section 10 of the *Mines Regulation Act* and sections 15 (a) and 64 of the *Mineral Act* and provided considerable assistance to the industry but in 1977 sections 15 (a) and 64 of the *Mineral Act* were rescinded.

At that time the committee became inoperative and disbanded.

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